SEARCH REQUEST FORM

Scientific and Technical Information Center

Requester's Full Name: JOHN MAPLES Examiner #: 62294 Date: 1/5/04
Art Unit: 1745 Phone Number ~~30~~ X 21287 Serial Number: 10/034,745
Mail Box and Bldg/Room Location: REM-6C89 Results Format Preferred (circle): PAPER DISK E-MAIL

If more than one search is submitted, please prioritize searches in order of need.

****

Please provide a detailed statement of the search topic, and describe as specifically as possible the subject matter to be searched. Include the elected species or structures, keywords, synonyms, acronyms, and registry numbers, and combine with the concept or utility of the invention. Define any terms that may have a special meaning. Give examples or relevant citations, authors, etc, if known. Please attach a copy of the cover sheet, pertinent claims, and abstract.

Title of Invention: COMPOSITIONS OF SINGLE-WALL CARBON NANOTUBES

Inventors (please provide full names): RICHARD SMALLEY, DANIEL COLBERT

Earliest Priority Filing Date: 3/7/1997

**For Sequence Searches Only* Please include all pertinent information (parent, child, divisional, or issued patent numbers) along with the appropriate serial number.*

A MEMBRANE COMPRISING AN ARRAY OF SINGLE-WALL CARBON NANOTUBES IN A SUBSTANTIALLY PARALLEL RELATIONSHIP, THE MEMBRANE IS NANOPOROUS

AND
- THE MEMBRANE IS CONDUCTIVE OR
- THE MEMBRANE HAS AT LEAST ONE PHOTOACTIVE MOLECULE ATTACHED THERETO/OR
- THE NANOTUBES HAVE ENDS DERIVATIZED W/ PHOTOACTIVE DYE MOLECULE/OR
- THE NANOTUBES HAVE AT LEAST ONE DOPANT PHYSICALLY ENTRAPPED BETWEEN THE NANOTUBES - Ex. METAL, HALOGEN, $FeCl_3$

ALSO → A BATTERY WITH THE ABOVE MEMBRANE - Ex. LITHIUM ION BATTERY

****

STAFF USE ONLY	**Type of Search**	**Vendors and cost where applicable**
Searcher: A. Fuller	NA Sequence (#)_____	STN ✓ 212
Searcher Phone #: _____	AA Sequence (#)_____	Dialog _____
Searcher Location: _____	Structure (#) _____	Questel/Orbit _____
Date Searcher Picked Up: _____	Bibliographic ✓	Dr.Link _____
Date Completed: 1/7/04	Litigation _____	Lexis/Nexis _____
Searcher Prep & Review Time: 20	Fulltext _____	Sequence Systems _____
Clerical Prep Time: _____	Patent Family _____	WWW/Internet _____
Online Time: 60	Other _____	Other (specify) _____

PTO-1590 (8-01)

STIC Search Report
EIC 1700

STIC Database Tracking Number: 111410

TO:	From:
John Maples Location: REM 6C89 Art Unit : 1745 January 7, 2004 Case Serial Number: 10/034745	Kathleen Fuller Location: EIC 1700 REMSEN 4B28 Phone: 571/272-2505 Kathleen.Fuller@uspto.gov

Search Notes

STIC Search Results Feedback Form

EIC17000

Questions about the scope or the results of the search? Contact ***the EIC searcher or contact:***

Kathleen Fuller, EIC 1700 Team Leader
571/272-2505 REMSEN 4B28

Voluntary Results Feedback Form

- *I am an examiner in Workgroup:* ☐ *Example: 1713*
- *Relevant prior art **found**, search results used as follows:*
  - ☐ 102 rejection
  - ☐ 103 rejection
  - ☐ Cited as being of interest.
  - ☐ Helped examiner better understand the invention.
  - ☐ Helped examiner better understand the state of the art in their technology.

Types of relevant prior art found:

- ☐ Foreign Patent(s)
- ☐ Non-Patent Literature
  (journal articles, conference proceedings, new product announcements etc.)

- *Relevant prior art **not found:***
  - ☐ Results verified the lack of relevant prior art (helped determine patentability).
  - ☐ Results were not useful in determining patentability or understanding the invention.

Comments:

Drop off or send completed forms to EIC1700 REMSEN 4B28

```
=> file hcaplu
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FILE COVERS 1907 - 7 Jan 2004  VOL 140 ISS 2
FILE LAST UPDATED: 6 Jan 2004  (20040106/ED)

 This file contains CAS Registry Numbers for easy and accurate
 substance identification.


=> d que l18
L3        14185 SEA FILE=HCAPLUS ABB=ON  NANOTUBE? OR SWNT#
L4         2636 SEA FILE=HCAPLUS ABB=ON  L3(L)(PREP OR IMF OR SPN)/RL
L5        36630 SEA FILE=HCAPLUS ABB=ON  MEMBRANE?(S)(POROUS OR POROS? OR
                CONDUCT? OR PHOTOACT? OR DOPANT? OR INTERCALA?)
L6           19 SEA FILE=HCAPLUS ABB=ON  L4 AND L5
L7           26 SEA FILE=HCAPLUS ABB=ON  L4 AND (DOPANT? OR INTERCALA?)(5A)(MET
                AL? OR HALOGEN? OR CHLOR? OR BROM? OR IODI? OR FLUOR? OR FECL3
                OR FERRIC(W)CHLORIDE)
L8            3 SEA FILE=HCAPLUS ABB=ON  L4 AND (DOPANT? OR INTERCALA?)(5A)IRON
                 CHLORIDE
L9           45 SEA FILE=HCAPLUS ABB=ON  (L6 OR L7 OR L8)
L10           6 SEA FILE=HCAPLUS ABB=ON  L9 AND ARRAY?
L11           1 SEA FILE=HCAPLUS ABB=ON  L9 AND PARALLEL?
L12           6 SEA FILE=HCAPLUS ABB=ON  L10 OR L11
L13           4 SEA FILE=HCAPLUS ABB=ON  L12 AND CARBON
L14          31 SEA FILE=HCAPLUS ABB=ON  L9 AND CARBON(4A)NANO?
L15          31 SEA FILE=HCAPLUS ABB=ON  L13 OR L14
L16           0 SEA FILE=HCAPLUS ABB=ON  L4 AND ARRAY? AND PARALELL?
L18          31 SEA FILE=HCAPLUS ABB=ON  L15 OR L16


=> file wpix
FILE 'WPIX' ENTERED AT 12:23:57 ON 07 JAN 2004
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FILE LAST UPDATED:          2 JAN 2004      <20040102/UP>
MOST RECENT DERWENT UPDATE:     200401        <200401/DW>
DERWENT WORLD PATENTS INDEX SUBSCRIBER FILE, COVERS 1963 TO DATE


>>> NEW WEEKLY SDI FREQUENCY AVAILABLE --> see NEWS  <<<

>>> SLART (Simultaneous Left and Right Truncation) is now
```

KATHLEEN FULLER EIC 1700 REMSEN 4B28 571/272-2505

available in the /ABEX field. An additional search field
/BIX is also provided which comprises both /BI and /ABEX <<<

>>> PATENT IMAGES AVAILABLE FOR PRINT AND DISPLAY <<<

>>> FOR A COPY OF THE DERWENT WORLD PATENTS INDEX STN USER GUIDE,
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SDIS USING THE TIME RANGE CODE WILL NEED TO BE UPDATED.
FOR FURTHER DETAILS: http://thomsonderwent.com/chem/polymers/ <<<

```
=> d que l26
L3        14185 SEA FILE=HCAPLUS ABB=ON  NANOTUBE? OR SWNT#
L22        1624 SEA FILE=WPIX ABB=ON  L3 OR NANO(W)TUB?
L23         514 SEA FILE=WPIX ABB=ON  L22 AND C01B031?/IC
L24          14 SEA FILE=WPIX ABB=ON  L23 AND MEMBRANE?
L25           4 SEA FILE=WPIX ABB=ON  L23 AND PARALLEL? AND ARRAY?
L26          17 SEA FILE=WPIX ABB=ON  L24 OR L25

=> file cerab
FILE 'CERAB' ENTERED AT 12:24:08 ON 07 JAN 2004
COPYRIGHT (C) 2004 Cambridge Scientific Abstracts (CSA)

FILE COVERS 1976 TO 23 MAY 1997 (970523/ED)

THIS FILE IS CURRENTLY NOT BEING UPDATED.

=> d que l28
L3        14185 SEA FILE=HCAPLUS ABB=ON  NANOTUBE? OR SWNT#
L27          12 SEA FILE=CERAB ABB=ON  L3 OR NANO(W)TUB?
L28           0 SEA FILE=CERAB ABB=ON  L27 AND MEMBRANE?

=> file japio
FILE 'JAPIO' ENTERED AT 12:24:27 ON 07 JAN 2004
COPYRIGHT (C) 2004 Japanese Patent Office (JPO)- JAPIO

FILE LAST UPDATED: 8 DEC 2003       <20031208/UP>
FILE COVERS APR 1973 TO AUGUST 29, 2003

<<< GRAPHIC IMAGES AVAILABLE >>>

=> d que l29
L3        14185 SEA FILE=HCAPLUS ABB=ON  NANOTUBE? OR SWNT#
L22        1624 SEA FILE=WPIX ABB=ON  L3 OR NANO(W)TUB?
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L23          514 SEA FILE=WPIX ABB=ON  L22 AND C01B031?/IC
L24           14 SEA FILE=WPIX ABB=ON  L23 AND MEMBRANE?
L25            4 SEA FILE=WPIX ABB=ON  L23 AND PARALLEL? AND ARRAY?
L29            7 SEA FILE=JAPIO ABB=ON  L24 OR L25


=> file jicst
FILE 'JICST-EPLUS' ENTERED AT 12:24:43 ON 07 JAN 2004
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FILE COVERS 1985 TO 5 JAN 2004 (20040105/ED)

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TERM (/CT) THESAURUS RELOAD.

=> d que l38
L3         14185 SEA FILE=HCAPLUS ABB=ON  NANOTUBE? OR SWNT#
L30         2273 SEA FILE=JICST-EPLUS ABB=ON  L3 OR NANO(W)TUB?
L31          222 SEA FILE=JICST-EPLUS ABB=ON  L30 AND MEMBRANE?
L32           14 SEA FILE=JICST-EPLUS ABB=ON  L31 AND ARRAY?
L34            3 SEA FILE=JICST-EPLUS ABB=ON  L31 AND (POROUS? OR POROS? OR
                  CONDUCT? OR PHOTOACT? OR DOPANT? OR INTERCALA?)(3A)MEMBRANE?
L36           56 SEA FILE=JICST-EPLUS ABB=ON  L31 AND (PREP? OR MANUF? OR
                  FABRICAT? OR SYNTHES?)(3A)NANO?
L37            4 SEA FILE=JICST-EPLUS ABB=ON  L32 AND L36
L38            6 SEA FILE=JICST-EPLUS ABB=ON  L34 OR L37


=> dup rem l18 l26 l29 l38
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PROCESSING COMPLETED FOR L18
PROCESSING COMPLETED FOR L26
PROCESSING COMPLETED FOR L29
PROCESSING COMPLETED FOR L38
L39            60 DUP REM L18 L26 L29 L38 (1 DUPLICATE REMOVED)

=> d all l39 1-60

L39  ANSWER 1 OF 60  WPIX  COPYRIGHT 2004 THOMSON DERWENT on STN
AN   2003-748178 [70]   WPIX
DNC  C2003-205093
TI   Making of carbon nanotubes for e.g. electronic devices comprises
     growing carbon nanotubes on at least two surfaces of a template
     structure.
DC   A60 E36 J04 L02 P73
IN   AJAYAN, P M; CAO, A; JUNG, Y J; RAMANATH, G; WEI, B; GANAPATHIRAMAN, R
```

PA (RENS-N) RENSSELAER POLYTECHNIC INST
CYC 102
PI WO 2003069019 A1 20030821 (200370)* EN 53p C23C016-26
RW: AT BE BG CH CY CZ DE DK EA EE ES FI FR GB GH GM GR HU IE IT KE LS LU MC MW MZ NL OA PT SD SE SI SK SL SZ TR TZ UG ZM ZW
W: AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CO CR CU CZ DE DK DM DZ EC EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NO NZ OM PH PL PT RO RU SC SD SE SG SK SL TJ TM TN TR TT TZ UA UG US UZ VC VN YU ZA ZM ZW
US 2003165418 A1 20030904 (200370) B32B001-08
ADT WO 2003069019 A1 WO 2003-US4032 20030211; US 2003165418 A1 Provisional US 2002-356069P 20020211, Provisional US 2002-385393P 20020603, US 2003-361640 20030211
PRAI US 2002-385393P 20020603; US 2002-356069P 20020211; US 2003-361640 20030211
IC ICM B32B001-08; C23C016-26
ICS B29D023-00; **C01B031-00; C01B031-02**
AB WO2003069019 A UPAB: 20031030
NOVELTY - Carbon **nanotubes** (14) are made by selectively and simultaneously growing the carbon **nanotubes** on at least two surfaces of a template structure (12) but not on exposed portions of the substrate such that the grown carbon **nanotubes** are controllably aligned perpendicular to a surface of the template structure.
DETAILED DESCRIPTION - INDEPENDENT CLAIMS are included for:
(1) Structure comprises:
(i) substrate,
(ii) template with at least two surfaces on the substrate,
(iii) carbon **nanotubes** aligned perpendicular to fist surface, and
(iv) carbon **nanotubes** aligned perpendicular to second surface;
(2) structure comprises:
(i) substrate,
(ii) template on substrate with at least one side surface with oblique inclination neither orthogonal nor parallel to the substrate, and
(iii) carbon **nanotubes** on the surface of the template comprising a **membrane** with an open truncated cone shape.
(3) porous carbon **nanotube** film comprises carbon **nanotubes** aligned lengthways in a direction with pores extending through the material in the same direction;
(4) article of manufacture comprises oxide particles with carbon **nanotubes** on their surfaces, aligned perpendicular to the surfaces,
(5) structure comprises:
(i) substrate,
(ii) template on substrate,
(iii) masking material covering part of the template, and
(iv) carbon **nanotubes** covering unmasked part of the template;
(6) Methods of forming the above structures by growing **nanotubes** on the template surface using a **nanotube** gas;
(7) making carbon **nanotubes** comprises growing **nanotubes** of different lengths on a growth surface during the same deposition step using a **nanotube** source gas;
(8) Method of making a device containing carbon **nanotubes** by growing a **nanotube** structure as described above, removing the **nanotube** structure from the substrate and placing the

nanotube structure in the device; and
(9) structure comprises:
(i) suspended template material layer(s),
(ii) carbon **nanotube** layer on first surface of template, and
(iii) carbon **nanotube** layer on opposite surface of template.
USE - For making of carbon **nanotubes** used in various applications, e.g. **nanotube**-based electronic devices, micro- and nano-electromechanical systems, micro- and nano-size porous supports and **membranes** for catalysts, fluidics or separation, or skeletal reinforcements for composites.
ADVANTAGE - The inventive method allows simultaneous, selective growth of both vertically and horizontally controllably aligned **nanotubes** on the template structure but not on a substrate in a single process step.
DESCRIPTION OF DRAWING(S) - The figure is a three dimensional schematic view of a carbon **nanotube** structure of the invention.
Template structure 12
Carbon nanotubes 14
Dwg.4D/12

FS CPI GMPI
FA AB; GI; DCN
MC CPI: A02-D; A08-M; E05-U02; J04-E03; L02-H04B

L39 ANSWER 2 OF 60 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2003-678438 [64] WPIX
DNN N2003-541625 DNC C2003-185321
TI Thermal interface structure useful in reducing thermal resistance between die with electronic circuit and cooling solution, comprises carbon **nanotubes** and interstitial material.
DC A85 E36 L03 T01 U11 V04
IN HOLALKERE, V R; MONTGOMERY, S W; HOLAKERE, V; MONTGOMERY, S
PA (ITLC) INTEL CORP
CYC 103
PI US 2003117770 A1 20030626 (200364)* 7p G06F001-20
EP 1329953 A1 20030723 (200364) EN H01L023-433
R: AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR IE IT LI LT LU LV MC MK NL PT RO SE SI SK TR
WO 2003054958 A1 20030703 (200364) EN H01L023-433
RW: AT BE BG CH CY CZ DE DK EA EE ES FI FR GB GH GM GR IE IT KE LS LU MC MW MZ NL OA PT SD SE SI SK SL SZ TR TZ UG ZM ZW
W: AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CO CR CU CZ DE DK DM DZ EC EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NO NZ OM PH PL PT RO RU SC SD SE SG SK SL TJ TM TN TR TT TZ UA UG UZ VC VN YU ZA ZM ZW
JP 2003249613 A 20030905 (200367) 7p H01L023-373
ADT US 2003117770 A1 US 2001-27442 20011220; EP 1329953 A1 EP 2002-258760 20021219; WO 2003054958 A1 WO 2002-US40515 20021217; JP 2003249613 A JP 2002-366897 20021218
PRAI US 2001-27442 20011220
IC ICM G06F001-20; H01L023-373; H01L023-433
ICS **C01B031-02**; H05K007-20
AB US2003117770 A UPAB: 20031006
NOVELTY - A thermal interface structure (22) comprises carbon **nanotube**(s), **parallel** to a heat transfer axis of the thermal interface, embedded in an interstitial material.

DETAILED DESCRIPTION - INDEPENDENT CLAIMS are included for:
(1) a heat transfer structure for use with a semiconductor comprising a heat sink (20) with surface to couple to the die (12), and a thermally conductive structure with a first surface coupled to the heat sink and a second surface coupled to the semiconductor die;
(2) an electronic assembly comprising at least one integrated circuit containing integrated circuit die(s), heat sink with surface coupled to the die, and thermally conductive structure;
(3) providing thermal intermediate between two objects comprising providing an **array** of aligned carbon **nanotubes** to the object(s), embedding the **array** aligned carbon **nanotubes** in the interstitial material, and coupling the **array** to the other object; and
(4) fabricating a thermal interface structure comprising embedding an **array** of aligned carbon **nanotubes** in the interstitial material, and removing excess material from the intermediate.
USE - The structure is useful in reducing thermal resistance between die and cooling solution. It is also useful with semiconductor in an electronic assembly, e.g. computer.
ADVANTAGE - The structure provides improved thermal performance to a die containing an electronic circuit.
DESCRIPTION OF DRAWING(S) - The figure shows an elevation view of a flip chip electronic device.
Electronic device 10
Die 12
Substrates 14, 16
Solder balls 18
Heat sink 20
Thermal interface structure 22
Dwg.1/6

FS CPI EPI
FA AB; GI; DCN
MC CPI: A11-B05; A11-C04; A12-E07C; A12-E10; E05-U02; L04-D
EPI: T01-L02A; U11-D02B1; U11-E01C; V04-T03A

L39 ANSWER 3 OF 60 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2003-509029 [48] WPIX
DNN N2003-404123 DNC C2003-136567
TI Carbon **nanotube** aggregate for electronic circuit element, has membranous metal catalysts provided in stepped layers, from which carbon **nanotubes** are grown horizontally, parallel to substrate surface.
DC E36 L03 U11 U12 V05
PA (SAOL) SANYO ELECTRIC CO LTD
CYC 1
PI JP 2003081622 A 20030319 (200348)* 10p C01B031-02 <--
ADT JP 2003081622 A JP 2001-273610 20010910
PRAI JP 2001-273610 20010910
IC ICM **C01B031-02**
ICS C23C016-26; C30B029-66; H01C013-00; H01G004-008; H01L021-822; H01L027-04; H01L029-06
AB JP2003081622 A UPAB: 20030729
NOVELTY - Several membranous metal catalysts (102) are provided at the side wall of the single crystal silicon substrate (101) in stepped layers, at different heights. Several carbon **nanotubes** (103) are grown horizontally, parallel to the substrate surface, with the metal catalyst as the starting point.
DETAILED DESCRIPTION - INDEPENDENT CLAIMS are also included for the following:

(1) electronic element;
(2) electronic circuit;
(3) capacitor; and
(4) carbon **nanotube** manufacturing method.

USE - For electronic element (claimed) such as resistor, capacitor (claimed), wiring, etc., of electronic circuit (claimed) including integrated circuits. Also for cold-cathode electron source of field emission display (FED), etc.

ADVANTAGE - Reduces resistance between the laminated carbon **nanotubes** and improves degree of freedom of the wiring. Also stabilizes characteristic properties of the electronic element and enables high integration, thereby resulting in miniaturized structure.

DESCRIPTION OF DRAWING(S) - The figure shows an example of the electronic element using the carbon **nanotube** aggregate. (Drawing includes non-English language text).

substrate 101
membranous metal catalyst 102
carbon **nanotubes** 103

Dwg.1/11

FS CPI EPI
FA AB; GI; DCN
MC CPI: E05-U02; L03-B01; L03-B03; L03-G05D; N06
EPI: U11-C01J6; U11-C05D3; U11-C05G1A; U11-C05G1B; U11-C18B9; U12-B03D; U12-E01B2; V05-L01A3A; V05-L05D1A

L39 ANSWER 4 OF 60 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2003-515250 [49] WPIX
DNN N2003-408831 DNC C2003-138296
TI Production of fiber comprises introducing catalytic particles formed in particle-forming chamber into **arraying** chamber together with carrier gas, and growing fibers including carbon as major component.
DC E36 F01 L03 Q68 V05
IN ISHIKURA, J; KITAMURA, S; TSUKAMOTO, T
PA (CANO) CANON KK; (ISHI-I) ISHIKURA J; (KITA-I) KITAMURA S; (TSUK-I) TSUKAMOTO T
CYC 34
PI EP 1291890 A2 20030312 (200349)* EN 23p H01J001-304
R: AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR IE IT LI LT LU LV MC MK NL PT RO SE SI SK TR
CN 1405371 A 20030326 (200349) D01F009-12
JP 2003160321 A 20030603 (200349) 13p C01B031-02 <--
US 2003048056 A1 20030313 (200349) H01J001-05
KR 2003022705 A 20030317 (200350) H01J001-30
ADT EP 1291890 A2 EP 2002-20153 20020909; CN 1405371 A CN 2002-132083 20020909; JP 2003160321 A JP 2002-189580 20020628; US 2003048056 A1 US 2002-234368 20020905; KR 2003022705 A KR 2002-54085 20020909
PRAI JP 2002-189580 20020628; JP 2001-273945 20010910
IC ICM **C01B031-02**; D01F009-12; H01J001-05; H01J001-30; H01J001-304
ICS B82B003-00; **C01B031-04**; D01F009-127; H01J001-14; H01J009-02; H01J029-04; H01J031-12
AB EP 1291890 A UPAB: 20030731
NOVELTY - Providing a simple and easy method of producing a fiber and in which fibrous carbon substances such as carbon **nanotubes** and graphite nanofibers are arranged in an **array** regularly at appropriate intervals and in which the number of emission points are increased, the current density enhanced and the service life increased.

DETAILED DESCRIPTION - Fiber is produced by introducing catalytic particles formed in particle-forming chamber (28) into **arraying**

chamber (27) together with carrier gas, to cause the catalytic particles to become arranged on a substrate (1) disposed in the **arraying** chamber; and growing fibers including carbon as major component based on catalytic particles arranged on substrate.

INDEPENDENT CLAIMS are also included for

(1) a method of producing an electron-emitting device comprising forming a cathode electrode on a substrate, and forming a fiber; and

(2) a method of producing an image display device comprising electron source and light emitting member.

The fiber grows by heating the catalytic particles arranged on the substrate in an atmosphere containing carbon.

USE - The invention is used for producing fiber used in electron-emitting device/electron source and image display device (claimed).

ADVANTAGE - The invention produces fiber simply and easily, and the fibrous carbon substances, e.g. carbon **nanotubes** and graphite nanofibers, are arranged in an **array** regularly at appropriate intervals in which the number of emission points per unit area is increased. The current density is enhanced, and the service life becomes long.

DESCRIPTION OF DRAWING(S) - The figure is a schematic view showing a gas deposition method.

Substrate 1

Transport tube 21

Catalytic material 24

Nozzle 25

Second chamber/ **Arraying** chamber 27

First chamber/ Particle-forming chamber 28

Dwg.2/11

FS CPI EPI GMPI

FA AB; GI; DCN

MC CPI: E05-U02; F01-D09A; L03-C02A; L03-G05; N02; N03-D01

EPI: V05-M03A

L39 ANSWER 5 OF 60 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 2003-514617 [49] WPIX

DNC C2003-138057

TI Method for preparing carbon nano-pipe on golden/iron series element composite **membrane.**

DC E36

IN GU, C; LU, X; SUN, H

PA (UYJI-N) UNIV JILIN

CYC 1

PI CN 1413906 A 20030430 (200349)* C01B031-02 <--

ADT CN 1413906 A CN 2002-133050 20020925

PRAI CN 2002-133050 20020925

IC ICM **C01B031-02**

AB CN 1413906 A UPAB: 20030731

NOVELTY - A process for preparing carbon **nanotubes** on the composite film of Au/Fe-series elements includes: sputtering Fe or Co or Ni layer on the Si or SiO2 substrate, sputtering Au layer to obtain composite film catalyst, putting the substrate in resistance-wire CVD equipment, introducing hydrogen gas and methane, and growing high-purity multi-wall carbon **nanotubes.**

DETAILED DESCRIPTION - A process for preparing carbon **nanotubes** on the composite film of Au/Fe-series elements includes: sputtering Fe or Co or Ni layer on the Si or SiO2 substrate, sputtering Au layer to obtain composite film catalyst, putting the substrate in

resistance-wire CVD equipment, introducing hydrogen gas and methane, and growing high-purity multi-wall carbon **nanotubes** (20-200 nm) at 600-950 deg.C and 12-30 Torr for 10-120 min. Another approach is also disclosed.

ADVANTAGE - Its advantages are simple process, short period and low cost.

Dwg.0/0

FS CPI
FA AB
MC CPI: E31-N03

L39 ANSWER 6 OF 60 HCAPLUS COPYRIGHT 2004 ACS on STN
AN 2003:534249 HCAPLUS
DN 139:328816
ED Entered STN: 13 Jul 2003
TI New nanotube synthesis strategy - application of sodium nanotubes formed inside anodic aluminium oxide as a reactive template
AU Wang, Lung-Shen; Lee, Chi-Young; Chiu, Hsin-Tien
CS Department of Applied Chemistry, National Chiao Tung University Hsinchu, Taichung, 30050, Taiwan
SO Chemical Communications (Cambridge, United Kingdom) (2003), (15), 1964-1965
CODEN: CHCOFS; ISSN: 1359-7345
PB Royal Society of Chemistry
DT Journal
LA English
CC 66-3 (Surface Chemistry and Colloids)
AB Formation of Na nanotubes inside the channels of anodic aluminum oxide (AAO) membranes has been achieved by decomposing NaH thermally on AAO. The as-produced material, Na@AAO, is applied as a reactive template to prepare other tubular materials. Reacting Na@AAO with gaseous C6Cl6 generates **carbon nanotubes** (ca. 250 nm, wall thickness of 20 nm, tube length of 60 μm) inside the AAO channels. Highly aligned bundles of nearly amorphous **carbon nanotubes** are isolated after AAO is removed.
ST sodium **porous** alumina **membrane carbon nanotube** prepn
IT **Nanotubes**
(**carbon; nanotube** synthesis strategy and application of sodium nanotubes formed inside anodic aluminum oxide as reactive template)
IT Membranes, nonbiological
Nanotubes
Porous materials
Thermal decomposition
(nanotube synthesis strategy and application of sodium nanotubes formed inside anodic aluminum oxide as reactive template)
IT 7440-23-5P, Sodium, processes
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PNU (Preparation, unclassified); **PREP (Preparation)**; PROC (Process)
(**nanotube** synthesis strategy and application of sodium **nanotubes** formed inside anodic aluminum oxide as reactive template)
IT 118-74-1, Hexachlorobenzene 1344-28-1, Alumina, reactions 7646-69-7, Sodium hydride
RL: RCT (Reactant); RACT (Reactant or reagent)
(nanotube synthesis strategy and application of sodium nanotubes formed

inside anodic aluminum oxide as reactive template)
IT 7440-44-0P, **Carbon**, preparation
RL: **SPN (Synthetic preparation); PREP (Preparation)**
(**nanotubes**; **nanotube** synthesis strategy and
application of sodium **nanotubes** formed inside anodic aluminum
oxide as reactive template)
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L39 ANSWER 7 OF 60 JICST-EPlus COPYRIGHT 2004 JST on STN
AN 1030256466 JICST-EPlus
TI Growth of Vertically Aligned Carbon **Nanotubes** inside Dome-structured Amorphous Silicon Holes by Plasma-enhanced Chemical Vapor Deposition.
AU PARK Y J; HAN I T; KIM H J; JIN Y W; KIM J W; JUNG J E; KIM J M
LEE N S
PARK C Y
CS Samsung Advanced Inst. Technol., Suwon, Kor
Sungkyunkwan Univ., Suwon, Kor
Sejong Univ., Seoul, Kor
SO Jpn J Appl Phys Part 1, (2003) vol. 42, no. 3, pp. 1414-1415. Journal Code: G0520B (Fig. 5, Ref. 12)
ISSN: 0021-4922
CY Japan
DT Journal; Short Communication
LA English
STA New
AB Vertically aligned carbon **nanotubes** (CNTs) were **synthesized** inside an **array** of dome-structured amorphous silicon (a-Si) holes on glass substrates. An a-Si layer swelled up as amorphous carbon (a-C) was grown to penetrate beneath the a-Si layer through patterned holes during thermal chemical vapor deposition (CVD), leading to an **array** of a-Si domes filled with a-C. Following the etching of a-C inside the domes, vertically aligned CNTs were selectively grown inside an **array** of hollow dome-structured holes using alternating-current plasma-enhanced chemical vapor deposition. The potential of applying this structure to gated field emitter **arrays** was discussed. (author abst.)
CC BK14060A; NC03150A (539.23:546; 621.382+)
CT amorphous semiconductor; silicon; plasma CVD; dome(geology); semiconductor

thin film; pattern formation; carbon; **nanotube**; field emission **array**; evaporated film; thin film growth; chemical vapor deposition; vacuum technology; field emission; functional device
BT semiconductor; amorphous state; glassy state; solid(matter); third row element; element; carbon group element; vapor deposition; anticline; fold(geology); geological structural element; thin film; **membrane** and film; second row element; molecular cluster; molecule; technology; electron emission; particle emission; emission
ST carbon **nanotube**; thermal chemical vapor deposition; vacuum microdevice; MEMS

L39 ANSWER 8 OF 60 JICST-EPlus COPYRIGHT 2004 JST on STN
AN 1030621301 JICST-EPlus
TI Field Emission from Bamboo-Like Multiwalled Carbon **Nanotube** **Arrays** Enhanced by Mild Oxidation
AU MATSUSHIMA M; ARAKI H; KAMIDE K; SAKATA T; MORI H; YOSHINO K
CS Osaka Univ., Osaka, Jpn
SO Jpn J Appl Phys Part 2, (2003) vol. 42, no. 8B, pp. L1036-L1038. Journal Code: F0599B
ISSN: 0021-4922
CY Japan
DT Journal; Short Communication
LA English
STA New
AB Multiwalled carbon **nanotube** (MWNT) **arrays** **prepared** by pyrolysis of Ni-phthalocyanine are heated at mild temperatures (100-300.DEG.C.) in air. The **arrays** oxidized at 150.DEG.C. exhibit the most excellent field emission characteristics, such as a turn-on voltage of 180 V and a current density of 10 mA cm-2 at 300 V. It is clarified by high-resolution electron microscopy of the MWNT that the MWNT tip is sharpened by selective oxidation at 150.DEG.C. without affecting the graphytic cell structure. The lowest turn-on voltage is still higher than the voltage evaluated in a single metallic emitter with an identical radius. The reason for this discrepancy is discussed. (author abst.)
CC BM09020S; BK14060A; NC03150A (537.58; 539.23:546; 621.382+)
CT **nanotube**; carbon; multistory structure; thermal oxidation; field emission; nickel complex; phthalocyanine complex; current density; MOCVD; evaporated film; field emission **array**; tunnel effect
BT molecular cluster; molecule; second row element; element; carbon group element; structure; oxidation; chemical reaction; electron emission; particle emission; emission; iron group element complex; transition metal complex; metal complex; complex(compound); coordination compound; compound(chemical); transition metal compound; iron group element compound; nickel compound; density; chemical vapor deposition; vapor deposition; thin film; **membrane** and film; quantum effect; effect
ST carbon **nanotube**; Fowler-Nordheim tunneling

L39 ANSWER 9 OF 60 HCAPLUS COPYRIGHT 2004 ACS on STN
AN 2003:274370 HCAPLUS
DN 139:29006
ED Entered STN: 09 Apr 2003
TI Single-crystal gallium nitride nanotubes
AU Goldberger, Joshua; He, Rongrui; Zhang, Yanfeng; Lee, Sangkwon; Yan, Haoquan; Choi, Heon-Jin; Yang, Peidong
CS Department of Chemistry, University of California, Berkeley, CA, 94720, USA
SO Nature (London, United Kingdom), (2003), 422(6932), 599-602

CODEN: NATUAS; ISSN: 0028-0836
PB Nature Publishing Group
DT Journal
LA English
CC 76-2 (Electric Phenomena)
AB Since the discovery of **carbon nanotubes** in 1991, there have been significant research efforts to synthesize nanometer-scale tubular forms of various solids. The formation of tubular nanostructure generally requires a layered or anisotropic crystal structure. There are reports of nanotubes made from silica, alumina, silicon and metals that do not have a layered crystal structure; they are synthesized by using **carbon nanotubes** and **porous membranes** as templates, or by thin-film rolling. These nanotubes, however, are either amorphous, polycryst., or exist only in ultrahigh vacuum. The growth of single-crystal semiconductor hollow nanotubes would be advantageous in potential nanoscale electronics, optoelectronics, and biochem.-sensing applications. Here, the authors report an epitaxial casting' approach for the synthesis of single-crystal GaN nanotubes with inner diams. of 30-200 nm and wall thicknesses of 5-50 nm. Hexagonal ZnO nanowires were used as templates for the epitaxial overgrowth of thin GaN layers in a chemical vapor deposition system. The ZnO nanowire templates were subsequently removed by thermal reduction and evaporation, resulting in ordered **arrays** of GaN nanotubes on the substrates. This templating process should be applicable to many other semiconductor systems.
ST gallium nitride single crystal nanotube epitaxial casting
IT Vapor deposition process
(chemical; single-crystal gallium nitride nanotubes by epitaxial casting approach)
IT Casting process
Epitaxy
(single-crystal gallium nitride nanotubes by epitaxial casting approach)
IT 25617-97-4P, Gallium mononitride
RL: **SPN (Synthetic preparation); PREP (Preparation)**
(single-crystal gallium nitride **nanotubes** by epitaxial casting approach)
RE.CNT 23 THERE ARE 23 CITED REFERENCES AVAILABLE FOR THIS RECORD
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L39 ANSWER 10 OF 60 HCAPLUS COPYRIGHT 2004 ACS on STN
AN 2003:64306 HCAPLUS
DN 138:361627
ED Entered STN: 28 Jan 2003
TI Synthesis and characterization of SWNT-heavy alkali **metal intercalation** compounds, effect of host SWNTs materials
AU Duclaux, L.; Salvetat, J. P.; Lauginie, P.; Cacciaguera, T.; Faugere, A. M.; Goze-Bac, C.; Bernier, P.
CS CRMD, CNRS-Universite, Orleans, 45071, Fr.
SO Journal of Physics and Chemistry of Solids (2003), 64(4), 571-581
CODEN: JPCSAW; ISSN: 0022-3697
PB Elsevier Science Ltd.
DT Journal
LA English
CC 78-3 (Inorganic Chemicals and Reactions)
Section cross-reference(s): 75
AB Singlewall **carbon nanotubes** (SWNTs) produced by elec.-arc and laser ablation methods were characterized by x-ray diffraction before and after the reaction with alkali metals (M = K, Rb, and Cs). Reaction with annealed SWNTs gave MC8 composition at saturation The alkali metal lattice showed short range order incommensurate with graphene cylinders of SWNTs. X-ray diffractogram simulations have enabled the study of the influence of SWNTs structure on that of intercalation compds. Chemical-purified bundles, constituted of open SWNTs, can be intercalated inside and between the tubes forming disordered structures. Annealed or pristine bundles were intercalated only between the tubes leading to short or long range ordered structure depending on host crystallinity and alkali metal (K, Rb or Cs). The expansion of the 2-dimensional SWNTs lattice after intercalation is comparable to graphite intercalation compds. Some 2-dimensional arrangements of SWNTs and K atoms are proposed and discussed to reproduce XRD results. 13C NMR and ESR studies of annealed doped SWNTs emphasize the fact that the **intercalation** compds. of SWNTs are **metallic.**
ST **carbon nanotube** potassium rubidium cesium intercalate prepn structure
IT **Nanotubes**
(**carbon**, potassium, rubidium and cesium intercalated; preparation of singlewall **carbon nanotubes** (SWNT)-heavy alkali **metal intercalation** compds. and effect on crystal structure of host SWNTs)
IT Crystal structure
Crystallinity
Short-range order
(preparation of singlewall **carbon nanotubes** (SWNT)-heavy alkali **metal intercalation** compds. and effect on crystal structure of host SWNTs)
IT 7440-44-0DP, **Carbon**, alkali **metal intercalated**
RL: PRP (Properties); **SPN (Synthetic preparation); PREP (Preparation)**
(**nanotubes**; preparation of singlewall **carbon nanotubes** (**SWNT**)-heavy alkali **metal intercalation** compds. and effect on crystal structure of host **SWNTs**)

IT 7440-09-7DP, Potassium, compound with **carbon nanotubes**
7440-17-7DP, Rubidium, compound with **carbon nanotubes**
7440-46-2DP, Cesium, compound with **carbon nanotubes**
RL: PRP (Properties); **SPN (Synthetic preparation)**; **PREP (Preparation)**
(preparation of singlewall **carbon nanotubes** (**SWNT**)-heavy alkali **metal intercalation** compds. and effect on crystal structure of host **SWNTs**)

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L39 ANSWER 11 OF 60 JICST-EPlus COPYRIGHT 2004 JST on STN
AN 1030552638 JICST-EPlus
TI Vertically Aligned Carbon **Nanotube** Growth Using Density-Controlled Catalyst Nanoparticles
AU HAYASHI NOBUYUKI; LEE K-Y; IKUNO TAKASHI; TSUJI KEITA; OKURA SHIGEHARU; HONDA SHIN'ICHI; KATAYAMA MITSUHIRO; HIRAO TAKASHI; OURA KENJIRO

CS Osaka Univ., Graduate School of Engineering, JPN
SO Shinku (Journal of the Vacuum Society of Japan), (2003) vol. 46, no. 7, pp. 542-545. Journal Code: G0194A (Fig. 3, Tbl. 1, Ref. 7)
CODEN: SHINAM; ISSN: 0559-8516
CY Japan
DT Journal; Short Communication
LA Japanese
STA New
AB We have **synthesized** highly aligned carbon **nanotubes** (CNTs) assembling density-controlled catalyst nanoparticles. The CNTs were grown on Fe or Ni catalyst nanoparticles by RF magnetron sputtering. Structural characterization of the nanoparticles and the CNTs were performed by SEM and TEM. It was found that the densities of both nanoparticles and CNTs were controlled within the ranges of 108-1010/cm2. The density of CNTs almost corresponds to that of the catalyst nanoparticles, and which indicates that the catalyst nanoparticles are the nuclei of the CNTs growth. (author abst.)
CC BK14060A; CB06100E (539.23:546; 544.47:544.344)
CT **nanotube**; carbon; evaporated film; iron catalyst; nickel catalyst; ultrafine particle; sputtered deposition; RF sputtering; magnetron sputtering; thin film growth; density; alignment; silicon; field emission **array**
BT molecular cluster; molecule; second row element; element; carbon group element; thin film; **membrane** and film; transition metal catalyst; metal catalyst; catalyst; fine particle; particle; physical vapor deposition; vapor deposition; sputtering; third row element
ST nanoparticle; carbon **nanotube**

L39 ANSWER 12 OF 60 JICST-EPlus COPYRIGHT 2004 JST on STN
AN 1030640129 JICST-EPlus
TI Titania/Polymer Nanocomposite Tubings:Template Synthesis and Nanoparticle Encapsulation
AU JIANGUO H; KUNITAKE T
CS Riken
SO Nippon Kagakkai Koen Yokoshu, (2003) vol. 83rd, no. 1, pp. 513. Journal Code: S0493A (Fig. 1)
ISSN: 0285-7626
CY Japan
DT Conference; Short Communication
LA English
STA New
AB Free standing, flexible and uniform titania/polymer nanocomposite tubings and nanoparticle-immobilized long capsules with controllable wall thicknesses are prepared by a simple filtration method employing **porous** alumina **membrane** as template. (author abst.)
CC YB02060D; CD01010D (661.66; 546)
CT porosity(property); alumina; **nanotube**; chemical synthesis; titanium oxide; ultrafine particle; encapsulation; polyvinyl alcohol; multilayer film; nanocomposites; organic-inorganic polymer hybrid; electron microscopy; chemical modification; effect
BT property; aluminum oxide; aluminum compound; 3B group element compound; metal oxide; oxide; chalcogenide; oxygen group element compound; oxygen compound; molecular cluster; molecule; carbon; second row element; element; carbon group element; chemical reaction; synthesis; titanium compound; 4A group element compound; transition metal compound; fine particle; particle; seal; closing(airtightness); polymer; thermoplastic; plastic; **membrane** and film; composite material; material; polymer complex; macromolecule; complex(substance); microscopy;

observation and view
ST template effect

L39 ANSWER 13 OF 60 HCAPLUS COPYRIGHT 2004 ACS on STN
AN 2003:526738 HCAPLUS
DN 139:284014
ED Entered STN: 10 Jul 2003
TI Nanowire and nanotube materials prepared from polymer fiber templates
AU Dong, Hong; Nyame, Verrad; Jones, Wayne E., Jr.
CS Department of Chemistry, State University of New York at Binghamton, Binghamton, NY, 13902, USA
SO Materials Research Society Symposium Proceedings (2003), Volume Date 2002, 739(Three-Dimensional Nanoengineered Assemblies), 217-222
CODEN: MRSPDH; ISSN: 0272-9172
PB Materials Research Society
DT Journal
LA English
CC 76-2 (Electric Phenomena)
Section cross-reference(s): 38, 57
AB The preparation of well-defined nanomaterials using template methods is well established in the materials literature including **porous** ceramics, open-framework layered structures and **porous** **membranes**. In an effort to prepare thermally and elec. conductive nanowire and nanotube materials, we have recently prepared carbon tubes using polymer fibers produced from an electrostatic, non-mech. "electrospinning" process as templates. Poly(Me methyacrylate) (PMMA) fibers with average diameter of 150-200 nm were initially fabricated as core materials. The fibers were subsequently coated with a thin layer (20.apprx.50 nm) of conductive polypyrrole (PPy) by in-situ polymerization Upon high temperature (1000°) treatment under inert atmospheric, the PMMA core fibers decomposed completely, followed by carbonization of the PPy wall. The structure of the carbon tubes subsequently produced was demonstrated by SEM and TEM. The carbon tubes were analyzed by IR, elemental anal. and electron diffraction. The results show that the tubes are largely carbon with a small amount of nitrogen and a relatively low crystallinity.
ST nanowire nanotube material polymer fiber template
IT Synthetic polymeric fibers, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(Me methacrylate, **carbon nanostructure** precursor; **nanowire** and **nanotube** materials prepared from polymer fiber templates)
IT Composites
(PMMA/PPy; nanowire and nanotube materials prepared from polymer fiber templates)
IT **Nanotubes**
(**carbon; nanowire** and **nanotube** materials prepared from polymer fiber templates)
IT Composition
(elemental anal.; of nanowire and nanotube materials prepared from polymer fiber templates)
IT Nanowires
(nanowire and nanotube materials prepared from polymer fiber templates)
IT IR spectra
Microstructure
Thermogravimetric analysis
(of nanowire and nanotube materials prepared from polymer fiber

templates)
IT 30604-81-0, Polypyrrole
RL: PRP (Properties); RCT (Reactant); TEM (Technical or engineered material use); RACT (Reactant or reagent); USES (Uses)
(PMMA coated with; nanowire and nanotube materials prepared from polymer fiber templates)
IT 9011-14-7, Polymethylmethacrylate
RL: PRP (Properties); RCT (Reactant); TEM (Technical or engineered material use); RACT (Reactant or reagent); USES (Uses)
(fiber, **carbon nanostructure** precursor; **nanowire** and **nanotube** materials prepared from polymer fiber templates)
IT 7440-44-0P, **Carbon**, properties
RL: PRP (Properties); **SPN (Synthetic preparation)**; TEM (Technical or engineered material use); **PREP (Preparation)**; USES (Uses)
(**nanotubes, nanowires; nanowire** and **nanotube** materials prepared from polymer fiber templates)
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L39 ANSWER 14 OF 60 HCAPLUS COPYRIGHT 2004 ACS on STN
AN 2002:960605 HCAPLUS
DN 138:26925
ED Entered STN: 19 Dec 2002
TI Fabrication method for proton conductor for use in electrochemical device
IN Hinokuma, Koichiro; Pietzak, Bjorn; Rost, Constance Gertrud; Ata, Masafumi
PA Sony Corporation, Japan
SO U.S., 41 pp., Cont.-in-part of U.S. Ser. No. 396,866, abandoned.
CODEN: USXXAM
DT Patent
LA English
IC ICM H01M004-58
NCL 429231800; 429306000; 429324000; 429188000
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38, 72
FAN.CNT 4

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	US 6495290	B1	20021217	US 2000-619166	20000719
	US 2002187378	A1	20021212	US 2002-171929	20020614

US 2002187403 A1 20021212 US 2002-171935 20020614
US 2002197521 A1 20021226 US 2002-171930 20020614
US 2003157388 A1 20030821 US 2002-280941 20021025
PRAI JP 1999-204038 A 19990719
US 1999-396866 B2 19990915
JP 2000-58116 A 20000303
JP 2000-157509 A 20000529
US 2000-619166 A3 20000719
US 2002-171930 A2 20020614
JP 2002-210428 A 20020719

AB A proton conductor mainly contains a carbonaceous material derivative, such as, a fullerene derivative, a carbon cluster derivative, or a tubular carbonaceous material derivative in which groups capable of transferring protons, for example, -OH groups or -OSO3H groups are introduced to carbon atoms of the carbonaceous material derivative The proton conductor is produced typically by compacting a powder of the carbonaceous material derivative The proton conductor is usable, even in a dry state, in a wide temperature range including ordinary temperature In particular, the proton conductor mainly containing the carbon cluster derivative is advantageous in increasing the strength and extending the selection range of raw materials. An electrochem. device, such as, a fuel cell, that employs the proton conductor is not limited by atmospheric conditions and can be of a small and simple construction. The proton conductor may contain a polymer in addition to the carbonaceous material derivative, which conductor can be formed, typically by extrusion molding, into a thin film having a large strength, a high gas permeation preventive ability, and a good proton conductivity

ST fuel cell proton conductor fabrication; electrochem cell proton conductor fabrication

IT Solid state fuel cells
(H-air; fabrication method for proton conductor for use in electrochem. device)

IT Clusters
Nanotubes
(**carbon**; fabrication method for proton conductor for use in electrochem. device)

IT Fullerenes
RL: DEV (Device component use); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
(derivs.; fabrication method for proton conductor for use in electrochem. device)

IT Fuel cell electrolytes
Membranes, nonbiological
(fabrication method for proton **conductor** for use in electrochem. device)

IT Fluoropolymers, preparation
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); SPN (Synthetic preparation); PREP (Preparation); PROC (Process)
(fabrication method for proton conductor for use in electrochem. device)

IT Carbonaceous materials (technological products)
Fluoropolymers, uses
RL: DEV (Device component use); USES (Uses)
(fabrication method for proton conductor for use in electrochem. device)

IT **Carbon** fibers, uses
RL: DEV (Device component use); USES (Uses)

(**nanofibers**; fabrication method for proton conductor for use in electrochem. device)
IT Ionic conductors
(protonic; fabrication method for proton conductor for use in electrochem. device)
IT 99685-96-8, Fullerene c60 115383-22-7, Fullerene c70 135113-16-5, Fullerene c84 136316-32-0, Fullerene c78 136846-59-8, Fullerene c82 140415-82-3, Fullerene c36
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)
(fabrication method for proton conductor for use in electrochem. device)
IT 9002-84-0P, Ptfe
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); SPN (Synthetic preparation); PREP (Preparation); PROC (Process)
(fabrication method for proton conductor for use in electrochem. device)
IT 9002-89-5, Polyvinyl alcohol 24937-79-9, Polyvinylidene fluoride 24981-14-4, Polyfluoroethylene
RL: DEV (Device component use); USES (Uses)
(fabrication method for proton conductor for use in electrochem. device)
IT 99685-96-8DP, [5,6]Fullerene-C60-Ih, hydrogen sulfated derivative 99685-96-8DP, [5,6]Fullerene-C60-Ih, hydroxyl hydrogen sulfated derivative 158158-06-6P, Dodecahydroxyfullerene-C60
RL: DEV (Device component use); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
(fabrication method for proton conductor for use in electrochem. device)
IT 7440-44-0, **Carbon**, uses
RL: DEV (Device component use); USES (Uses)
(**nanotubes**; fabrication method for proton conductor for use in electrochem. device)
IT 7440-44-0DP, Carbon, hydrogen sulfated and hydroxylated derivs.
RL: DEV (Device component use); **SPN (Synthetic preparation)**; **PREP (Preparation)**; USES (Uses)
(**nanotubes**; fabrication method for proton conductor for use in electrochem. device)
RE.CNT 11 THERE ARE 11 CITED REFERENCES AVAILABLE FOR THIS RECORD
RE
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(5) Chiang, L; J Chem Soc 1992, P1791 HCAPLUS
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(7) Kroto, H; Nature 1985, V318, P162 HCAPLUS
(8) Loutfy; US 5470680 A 1995 HCAPLUS
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(10) Park, C; J Chem Society 1999, P10572 HCAPLUS
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L39 ANSWER 15 OF 60 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2003-041016 [03] WPIX
DNN N2003-032122 DNC C2003-009913
TI **Nanotube array** comprises a substrate, a catalyst layer having partial regions on the surface of the substrate, **nanotubes**

arranged on the surface of the catalyst layer **parallel**.
DC L02 Q68 U11 U12
IN GRAHAM, A; HOFMANN, F; KRETZ, J; KREUPL, F; LUYKEN, J R; ROESNER, W; LUYKEN, R J
PA (INFN) INFINEON TECHNOLOGIES AG
CYC 21
PI WO 2002092505 A2 20021121 (200303)* DE 61p C01B031-02 <--
RW: AT BE CH CY DE DK ES FI FR GB GR IE IT LU MC NL PT SE TR
W: JP US
DE 10123876 A1 20021128 (200303) B82B003-00
ADT WO 2002092505 A2 WO 2002-EP5433 20020516; DE 10123876 A1 DE 2001-10123876 20010516
PRAI DE 2001-10123876 20010516
IC ICM B82B003-00; **C01B031-02**
AB WO 200292505 A UPAB: 20030113
NOVELTY - **Nanotube array** comprises a substrate; a catalyst layer having partial regions on the surface of the substrate; **nanotubes** (205) arranged on the surface of the catalyst layer **parallel** to the surface of the substrate; and pores arranged **parallel** to the surface of the substrate.
DETAILED DESCRIPTION - An INDEPENDENT CLAIM is also included for a process for the production of the **nanotube array**.
Preferred Features: The **array** has an electrically insulating layer (202) between the substrate and the catalyst layer. The partial regions of the catalyst layer are decoupled from each other. The **array** also has a switching circuit arrangement by which the **nanotubes** can be controlled and/or read.
USE - Used in microelectronics.
ADVANTAGE - The **array** can be easily produced.
DESCRIPTION OF DRAWING(S) - The drawing shows a cross-section through the **nanotube array**.
substrate 201
electrically insulating layer 202
nanotubes 205
Dwg.2/5
FS CPI EPI GMPI
FA AB; GI
MC CPI: L02-H04B; N06-C08
EPI: U11-C18C; U12-B03F2A

L39 ANSWER 16 OF 60 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2003-092924 [08] WPIX
DNN N2003-073763 DNC C2003-023181
TI Preparation of carbon **nanotubes** involves locating carbon **nanotube** growth-supporting substrate in localized heating zone within reaction chamber.
DC B04 D16 E36 J04 L02 L03 Q68 U11 U12 V05
IN DAI, L; HAMMEL, E; HUANG, S; JOHANSEN, O; MAU, A; TANG, X
PA (CSIR) COMMONWEALTH SCI & IND RES ORG
CYC 100
PI WO 2002081366 A1 20021017 (200308)* EN 30p B82B003-00
RW: AT BE CH CY DE DK EA ES FI FR GB GH GM GR IE IT KE LS LU MC MW MZ NL OA PT SD SE SL SZ TR TZ UG ZM ZW
W: AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CO CR CU CZ DE DK DM DZ EC EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NO NZ OM PH PL PT RO RU SD SE SG SI SK SL TJ TM TN TR TT TZ UA UG US UZ VN YU ZA ZM ZW

ADT WO 2002081366 A1 WO 2002-AU437 20020404
PRAI AU 2001-4217 20010404
IC ICM B82B003-00
ICS B82B001-00; **C01B031-02**; C23C016-46; D01F009-12; D01F009-127; D01F009-133

AB WO 200281366 A UPAB: 20030204
NOVELTY - Preparation (M1) of carbon **nanotubes** comprising locating carbon **nanotube** growth-supporting substrate (1) in a localized heating zone (8) within a reaction chamber (7); and passing a gaseous carbonaceous material into the reaction chamber such that the gaseous material passes over and contacts the substrate where the gaseous material undergoes pyrolysis under the influence of heat, is new.

DETAILED DESCRIPTION - INDEPENDENT CLAIMS are also included for:

(1) preparing multilayer carbon **nanotube** materials comprising synthesizing a first layer of carbon **nanotubes** on a substrate under a first set of pyrolysis conditions to provide a **nanotube** coated substrate, and synthesizing a second layer of carbon **nanotubes** on the **nanotube** coated substrate under a second set of pyrolysis conditions;

(2) preparation of a hetero-structured multilayer carbon **nanotube** film comprising synthesizing a first layer of carbon **nanotubes** on a substrate under a first set of pyrolysis conditions to provide a **nanotube** coated substrate; coating a layer of pyrolysis resistant material onto the **nanotube** coated substrate to provide a hetero-structured multilayer substrate; and synthesizing a second layer of carbon **nanotubes** on the hetero-structured multilayer substrate under a second set of pyrolysis conditions;and

(3) a reactor for preparing carbon **nanotubes** comprising a reaction chamber; substrated supporting-mechanism(s) located within the reaction chamber; heating element(s) (2) located with the reaction chamber; and device for passing a gaseous carbonaceous material into the reaction chamber such that is passes over and contacts the substrate.

USE - (M1) is useful for preparing carbon **nanotubes** useful in the constructions of devices, e.g. electron emitters, field-emission transistors, electrodes for photovoltaic cells and light emitting diodes, optoelectronic elements, bismuth actuators, chemical and biological sensors, gas and energy storage, molecular filtration **membranes** and energy-absorbing materials.

ADVANTAGE - In view of the lower temperatures required and the fact that the heating is localized, the invention can provide substantial energy and cost savings relative to conventional methods. Also, since the heating is localized to the heating zone, the growth of carbon **nanotubes** at sites within the reaction chamber other than on the substrate and the production of amorphous carbon byproducts inside the reaction chamber are minimized. This also leads to a cleaner reaction chamber and purer carbon **nanotube** films being formed. If amorphous carbon is deposited on other hot surfaces, e.g. exposed areas of the heating element, they are readily removed by heating removed by heating the heating element in air, causing the amorphous carbon to be oxidized to carbon dioxide. The reaction chamber thus can be easily cleaned.

DESCRIPTION OF DRAWING(S) - The figure shows a diagrammatic side-view representation of a pyrolysis flow reactor.
Substrate 1
Heating element 2
Reaction chamber 7
Localized heating zone 8
Dwg.1a/1

FS CPI EPI GMPI
FA AB; GI; DCN
MC CPI: B11-C09; D05-H09; E05-U02; J04-B01; L02-H04B; L03-D01D; L04-C11C; L04-E03A; L04-E05D; N02; N03; N03-E
EPI: U11-C01J6; U11-C18B9; U12-B03D; U12-E01B2; V05-L01A3A; V05-L05B5; V05-L05D1A

L39 ANSWER 17 OF 60 HCAPLUS COPYRIGHT 2004 ACS on STN
AN 2002:933597 HCAPLUS
DN 138:214124
ED Entered STN: 10 Dec 2002
TI Synthesis and magnetic behavior of an **array** of nickel-filled **carbon nanotubes**
AU Bao, Jianchun; Zhou, Quanfa; Hong, Jianming; Xu, Zheng
CS Laboratory of Solid State Microstructures, State Key Laboratory of Coordination Chemistry, Coordination Chemistry Institute, Nanjing University, Nanjing, 210093, Peop. Rep. China
SO Applied Physics Letters (2002), 81(24), 4592-4594
CODEN: APPLAB; ISSN: 0003-6951
PB American Institute of Physics
DT Journal
LA English
CC 77-1 (Magnetic Phenomena)
AB Highly-ordered **arrays** of Ni-filled C nanotubes were fabricated by a 2nd-order template method. First, an **array** of aligned C nanotubes was generated in a **porous** alumina **membrane** by catalytic pyrolysis of acetylene. The desired material, such as Ni, was then filled into the aligned C nanotubes by electrodeposition. The remarkable features of this method are: (i) high yield of metal-filled C nanotubes, and (ii) the wall thickness of the C nanotubes, and the length, diameter, and structure of the metal nanowires in the C nanotubes are controllable via changing exptl. conditions. This method should be applicable for preparation of other metal- and alloy-filled C nanotubes, and allow the reliable technol. application in nanoelectronic devices, high-d. magnetic memories, electrochem. energy storages and sensors, etc.
ST nickel filled **carbon nanotube** prepn magnetism
IT **Nanotubes**
(**carbon**, nickel-filled; synthesis and magnetic behavior of **array** of nickel-filled **carbon nanotubes**)
IT Electrodeposition
Magnetic hysteresis
Membranes, nonbiological
(synthesis and magnetic behavior of **array** of nickel-filled **carbon nanotubes**)
IT 1344-28-1, Alumina, processes
RL: PEP (Physical, engineering or chemical process); PYP (Physical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(**porous membrane**; synthesis and magnetic behavior of **array** of nickel-filled **carbon nanotubes**)
IT 74-86-2, Acetylene, processes
RL: CPS (Chemical process); NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(precursor; synthesis and magnetic behavior of **array** of nickel-filled **carbon nanotubes**)
IT 7705-08-0, Iron chloride (FeCl3), processes 7786-81-4, Nickel sulfate
RL: CPS (Chemical process); NUU (Other use, unclassified); PEP (Physical,

engineering or chemical process); PROC (Process); USES (Uses)
(synthesis and magnetic behavior of **array** of nickel-filled **carbon nanotubes**)
IT 1333-74-0, Hydrogen, uses 7440-37-1, Argon, uses 7440-48-4, Cobalt, uses
RL: NUU (Other use, unclassified); USES (Uses)
(synthesis and magnetic behavior of **array** of nickel-filled **carbon nanotubes**)
IT 7440-02-0P, Nickel, uses
RL: **SPN (Synthetic preparation)**; TEM (Technical or engineered material use); **PREP (Preparation)**; USES (Uses)
(synthesis and magnetic behavior of **array** of nickel-filled **carbon nanotubes**)
IT 7440-44-0, **Carbon**, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(synthesis and magnetic behavior of **array** of nickel-filled **carbon nanotubes**)
RE.CNT 14 THERE ARE 14 CITED REFERENCES AVAILABLE FOR THIS RECORD
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L39 ANSWER 18 OF 60 HCAPLUS COPYRIGHT 2004 ACS on STN
AN 2002:501606 HCAPLUS
DN 137:240190
ED Entered STN: 03 Jul 2002
TI Injection of polarized spins and anti-localization caused by slight doping of heavy impurities into one end of **carbon nanotubes**
AU Haruyama, Junji; Takesue, Izumi; Hasegawa, Tetsuro
CS Aoyama Gakuin University, Tokyo, 157-8572, Japan
SO Materials Research Society Symposium Proceedings (2002), 706(Making Functional Materials with Nanotubes), 139-144
CODEN: MRSPDH; ISSN: 0272-9172
PB Materials Research Society
DT Journal
LA English
CC 76-2 (Electric Phenomena)
Section cross-reference(s): 65, 78
AB Electrode atoms are slightly diffused, with only .apprx.5% volume-ratio, into the top end of multi-walled **carbon nanotubes** (MWNTs), standing in **nano**-pores of **porous** Alumina **membranes**. Diffusion of light-mass materials (carbon and aluminum) leads to weak localization in the Altshuler-Aronov-Spivak (AAS) oscillations, which is qual. consistent with previous works on MWNTs. In contrast, diffusion of heavy materials (gold and platinum) changes this weak localization into an anti-localization in the MWNT bulk. This effect

is only observable when electrons are injected through the diffusion region, and undergo a π -phase shift in their electron waves, caused by polarized injection of spin-flipped electrons due to spin-orbit interaction in the diffusion-region of the MWNT bulk.

ST heavy impurity polarized spin antilocalization **carbon nanotube**

IT **Nanotubes**
(**carbon**; injection of polarized spins and anti-localization caused by slight doping of heavy impurities into one end of **carbon nanotubes**)

IT Electron delocalization
Impurities
Spin polarization
Spin-orbit coupling
(injection of polarized spins and anti-localization caused by slight doping of heavy impurities into one end of **carbon nanotubes**)

IT 7440-06-4, Platinum, uses 7440-57-5, Gold, uses
RL: MOA (Modifier or additive use); USES (Uses)
(injection of polarized spins and anti-localization caused by slight doping of heavy impurities into one end of **carbon nanotubes**)

IT 7440-44-0P, **Carbon**, properties
RL: PNU (Preparation, unclassified); PRP (Properties); TEM (Technical or engineered material use); **PREP (Preparation)**; USES (Uses)
(**nanotubes**; injection of polarized spins and anti-localization caused by slight doping of heavy impurities into one end of **carbon nanotubes**)

RE.CNT 21 THERE ARE 21 CITED REFERENCES AVAILABLE FOR THIS RECORD

RE

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(9) Haruyama, J; "Quantum Mesoscopic Phenomena and Mesoscopic Devices in Microelectronics", NATO science series C-559 2000, V145
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L39 ANSWER 19 OF 60 HCAPLUS COPYRIGHT 2004 ACS on STN
AN 2002:493007 HCAPLUS
DN 138:28094
ED Entered STN: 01 Jul 2002
TI Matrix Synthesis of N-Containing **Carbon Nanotubes**

AU Brichka, S. Ya.; Prikhod'ko, G. P.; Brichka, A. V.; Ogenko, V. M.; Chuiko, A. A.

CS Institute of Surface Chemistry, National Academy of Sciences of Ukraine, Kiev, 03680, Ukraine

SO Theoretical and Experimental Chemistry (Translation of Teoreticheskaya i Eksperimental'naya Khimiya) (2002), 38(2), 114-117
CODEN: TEXCAK; ISSN: 0040-5760
PB Kluwer Academic/Consultants Bureau
DT Journal
LA English
CC 57-8 (Ceramics)
Section cross-reference(s): 78

AB N-containing **carbon nanotubes** were prepared by the pyrolysis of acetonitrile in an alumina matrix. Nanotubes were obtained with given diameter and length. Amorphous carbon is also formed on the alumina surface in the acetonitrile pyrolysis.

ST **carbon nanotube** nitrogen contg prepn anodic alumina membrane template

IT **Nanotubes**
(**carbon**, N-containing; synthesis of N-containing **carbon nanotubes** by pyrolysis of acetonitrile in an alumina matrix)

IT Thermal decomposition
(pyrolytic; synthesis of N-containing **carbon nanotubes** by pyrolysis of acetonitrile in an alumina matrix)

IT 75-05-8, Acetonitrile, processes
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)
(carbon source; synthesis of N-containing **carbon nanotubes** by pyrolysis of acetonitrile in an alumina matrix)

IT 7440-44-0P, **Carbon**, preparation
RL: PRP (Properties); **SPN (Synthetic preparation)**; **PREP (Preparation)**
(**nanotubes**, N-contg; synthesis of N-containing **carbon nanotubes** by pyrolysis of acetonitrile in an alumina matrix)

IT 1344-28-1, Aluminum oxide (Al2O3), uses
RL: NUU (Other use, unclassified); USES (Uses)
(**porous membranes**, anodic; synthesis of N-containing **carbon nanotubes** by pyrolysis of acetonitrile in an alumina matrix)

RE.CNT 10 THERE ARE 10 CITED REFERENCES AVAILABLE FOR THIS RECORD

RE
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L39 ANSWER 20 OF 60 HCAPLUS COPYRIGHT 2004 ACS on STN
AN 2002:443513 HCAPLUS
DN 137:207738
ED Entered STN: 13 Jun 2002

TI Preparation of multi-walled **carbon nanotube** **array** electrodes and its electrochemical intercalation behavior of Li ions

AU Zhao, J.; Gao, Q. Y.; Gu, C.; Yang, Y.
CS State Key Lab for Physical Chemistry of Solid Surface and Department of Chemistry, Xiamen University, Xiamen, 361005, Peop. Rep. China

SO Chemical Physics Letters (2002), 358(1,2), 77-82
CODEN: CHPLBC; ISSN: 0009-2614
PB Elsevier Science B.V.
DT Journal
LA English
CC 72-2 (Electrochemistry)
Section cross-reference(s): 52, 78

AB In this work, multi-walled **carbon nanotube** **array** electrodes were prepared by chemical vapor decomposition (CVD) in nano-sized **porous** alumina **membranes** (the diameter of the pore is about 55 nm). The intercalation behavior of Li+ in the **array** electrodes was also primarily investigated. The importance of selection of current collectors for the study of Li+-intercalation processes in **carbon nanotube array** electrodes was stressed. Since **carbon nanotube** **array** electrodes can give high c.d. due to its high surface area and ordered electrode configuration, which may be used in some fields such as chemical sensors and micro-battery.

ST multi walled **carbon nanotube array** electrode lithium intercalation

IT **Nanotubes**
(**carbon**; preparation of multi-walled **carbon** **nanotube array** electrodes and its electrochem. intercalation behavior of Li ions)

IT Vapor deposition process
(chemical; preparation of multi-walled **carbon nanotube** **array** electrodes by chemical vapor deposition in nano-sized **porous** alumina **membranes**)

IT Intercalation
(electrochem.; of multi-walled **carbon nanotube** **array** electrodes of Li ions)

IT Anodization
(of aluminum in oxalic acid solution to prepare porous alumina template for preparation of multi-walled **carbon nanotube** **array** electrode)

IT Cyclic voltammetry
(of multi-walled **carbon nanotube array** membrane electrodes in EC+DMC containing LiPF6)

IT Electrodes
(preparation of multi-walled **carbon nanotube** **array** electrodes and its electrochem. intercalation behavior of Li ions)

IT **Porous** materials
(preparation of multi-walled **carbon nanotube** **array** electrodes by chemical vapor deposition in nano-sized **porous** alumina **membranes**)

IT 7429-90-5, Aluminum, uses
RL: CPS (Chemical process); DEV (Device component use); PEP (Physical, engineering or chemical process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent); USES (Uses)
(anodization in oxalic acid solution to prepare porous alumina template for preparation of multi-walled **carbon nanotube**

array electrode)
IT 144-62-7, Oxalic acid, uses
RL: NUU (Other use, unclassified); USES (Uses)
(anodization of aluminum in oxalic acid solution to prepare porous alumina template for preparation of multi-walled **carbon nanotube array** electrode)
IT 7664-39-3, Hydrofluoric acid, reactions
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)
(dissoln. of alumina in preparation of multi-walled **carbon nanotube array** electrodes by chemical vapor deposition in pores of alumina substrate, in solution of)
IT 17341-24-1, Lithium 1+, reactions
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)
(electrochem. intercalation of multi-walled **carbon nanotube array** electrodes of Li ions)
IT 21324-40-3, Lithium hexafluorophosphate
RL: NUU (Other use, unclassified); USES (Uses)
(electrochem. intercalation of multi-walled **carbon nanotube array** electrodes of Li ions in EC+DMC containing)
IT 96-49-1, Ethylene carbonate 616-38-6, Dimethylcarbonate
RL: NUU (Other use, unclassified); USES (Uses)
(electrochem. intercalation of multi-walled **carbon nanotube array** electrodes of Li ions in EC+DMC containing LiPF6)
IT 7440-48-4P, Cobalt, uses
RL: CAT (Catalyst use); CPS (Chemical process); PEP (Physical, engineering or chemical process); PNU (Preparation, unclassified); PREP (Preparation); PROC (Process); USES (Uses)
(electrodeposition in pores of porous alumina)
IT 7440-44-0P, **Carbon**, processes
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PNU (Preparation, unclassified); **PREP (Preparation)**; PROC (Process)
(**nanotubes**; preparation of multi-walled **carbon nanotube array** electrodes and its electrochem. intercalation behavior of Li ions)
IT 1344-28-1, Alumina, uses
RL: NUU (Other use, unclassified); USES (Uses)
(preparation of multi-walled **carbon nanotube array** electrodes by chemical vapor deposition in nano-sized **porous** alumina **membranes**)
IT 74-86-2, Acetylene, reactions
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)
(preparation of multi-walled **carbon nanotube array** electrodes by chemical vapor deposition in pores of alumina substrate coated with cobalt as catalyst, in gas mixture containing)
IT 7727-37-9, Nitrogen, uses
RL: NUU (Other use, unclassified); USES (Uses)
(preparation of multi-walled **carbon nanotube array** electrodes by chemical vapor deposition in pores of alumina substrate coated with cobalt as catalyst, in gas mixture containing C2H2 and)
IT 630-08-0, **Carbon** monoxide, reactions
RL: CPS (Chemical process); PEP (Physical, engineering or chemical

process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)
(use for reducing possible oxide on cobalt deposited in pores of alumina substrate)
IT 7487-94-7, Mercury dichloride, reactions
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)
(use for removing alumina membrane from substrate in solution of)
RE.CNT 19 THERE ARE 19 CITED REFERENCES AVAILABLE FOR THIS RECORD
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(19) Zhou, O; Science 1994, V263, P1744 HCAPLUS

L39 ANSWER 21 OF 60 JICST-EPlus COPYRIGHT 2004 JST on STN
AN 1020269688 JICST-EPlus
TI Superconductivity by proximity effect in **arrays** of single-walled carbon **nanotubes** with large diameter and thick shell.
AU TAKAZAWA KAZUYA; KIRIYAMA HIROSHI; ISHIDA SHIN'YA; TAKESUE IDEMI; HARUYAMA JUNJI
MARCUS C M
CS Aoyama Gakuin Univ., Sch. of Sci. and Eng.
Harvard Univ.
SO Denshi Joho Tsushin Gakkai Gijutsu Kenkyu Hokoku (IEIC Technical Report (Institute of Electronics, Information and Communication Enginners)), (2002) vol. 101, no. 618(ED2001 232-244), pp. 33-40. Journal Code: S0532B (Fig. 6, Ref. 13)
CY Japan
DT Journal; Article
LA Japanese
STA New
AB We report abrupt resistance drop observed at T=3.4K and T=9.5K in **arrays** of high-interface-transparency superconductor(Niobium:Nb)/single-walled carbon **nanotubes**(**SWNTs**) junctions, **synthesized** in **nano-porous** Alumina **membranes**, with large diameter and thick shell. Analysis of conductance dips, which strongly depends on length of **nanotubes**, with negative conductance regions observed in **arrays** of low-interface-transparency Tin/**SWNTs** reveals that phase coherent length for coherent electron-pairs injected by Andreev tunneling is as large as 2Mm around 2K in our **nanotubes**, even though such superconductor/**SWNT** interface. Based on this, we

argue the resistance drop in the Nb/**SWNTs** is attributed to superconductivity by proximity effect. The large diameter, thick shell, and synthesis into pores of Alumina **membranes** strongly contribute to this superconductivity. (author abst.)

CC BM04025Q (537.312.62:546.26)

CT diameter; thickness of strata; monolayer; superconductor; proximity effect; porous medium; alumina; Andreev reflection; electric resistance; voltage dependence; temperature dependence; reflectivity; tunnel effect; **nanotube**

BT length; geometric quantity; thickness; layer; superconducting material; material; effect; porous object; aluminum oxide; aluminum compound; 3B group element compound; metal oxide; oxide; chalcogenide; oxygen group element compound; oxygen compound; reflection; resistance; dependence; ratio; quantum effect; molecular cluster; molecule; carbon; second row element; element; carbon group element

ST carbon **nanotube**

L39 ANSWER 22 OF 60 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 2001-451330 [48] WPIX

DNN N2001-334209 DNC C2001-136158

TI Aligning single-wall carbon **nano-tubes** for making e.g. high strength fibers and cables, comprises subjecting to magnetic or electric field.

DC A60 E36 H04 J04 L03 U12

IN CASAVANT, M J; CHIANG, W; COLBERT, D T; HAUGE, R H; HUFFMAN, C B; QIN, X C; SAINI, R K; SMALLEY, R E; SMITH, K A; WALTERS, D A; YAKOBSON, B I

PA (UYRI-N) UNIV RICE WILLIAM MARSH

CYC 95

PI WO 2001030694 A1 20010503 (200148)* EN 73p C01B031-02 <--
RW: AT BE CH CY DE DK EA ES FI FR GB GH GM GR IE IT KE LS LU MC MW MZ NL OA PT SD SE SL SZ TZ UG ZW
W: AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CR CU CZ DE DK DM DZ EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NO NZ PL PT RO RU SD SE SG SI SK SL TJ TM TR TT TZ UA UG US UZ VN YU ZA ZW
AU 2001022483 A 20010508 (200149) C01B031-02 <--
EP 1226093 A2 20020731 (200257) EN C01B031-02 <--
R: AL AT BE CH CY DE DK ES FI FR GB GR IE IT LI LT LU LV MC MK NL PT RO SE SI
CN 1359352 A 20020717 (200268) C01B031-02 <--
KR 2002047030 A 20020621 (200280) B82B003-00
JP 2003512286 W 20030402 (200325) 70p C01B031-02 <--

ADT WO 2001030694 A1 WO 2000-US29722 20001027; AU 2001022483 A AU 2001-22483 20001027; EP 1226093 A2 EP 2000-986202 20001027, WO 2000-US29722 20001027; CN 1359352 A CN 2000-805107 20001027; KR 2002047030 A KR 2001-711810 20010917; JP 2003512286 W WO 2000-US29722 20001027, JP 2001-533054 20001027

FDT AU 2001022483 A Based on WO 2001030694; EP 1226093 A2 Based on WO 2001030694; JP 2003512286 W Based on WO 2001030694

PRAI US 1999-161717P 19991027

IC ICM B82B003-00; **C01B031-02**

AB WO 200130694 A UPAB: 20011129

NOVELTY - Single-wall carbon **nanotubes** (**SWNT**) are aligned by subjecting them to a magnetic field or an electric field.

DETAILED DESCRIPTION - INDEPENDENT CLAIMS are also included for the following:

(A) a method of assembling field-aligned **SWNT** into three-dimensional structure in which the tubes are **parallel** to

each other;
(B) a material comprising aligned single-wall **nanotubes**;
(C) a method of creating objects and materials from field-aligned tubes in solution or suspension, comprising modifying the solvent strength of the **nano-tube** solution to precipitate tubes;
(D) a method of forming a **membrane** of aligned **SWNT**, comprising field-aligning end-derivatized **SWNT**, and diffusing and chemically attaching the **SWNT** to a substrate oriented perpendicular to the field-alignment direction;
(E) an apparatus for forming **arrays** of aligned **SWNT**, comprising a tank, a positive electrode disposed in the tank, a negative electrode disposed in the tank, a filter disposed in the tank near the positive electrode, **SWNT** suspended in a solution within a tank, and a source of magnetic field for aligning the **SWNT**; and
(F) a method of post-processing macroscopic ordered **nano-tube** assemblies to selectively enhance material properties.
USE - Used for aligning single-wall carbon **nano-tubes**. It can be employed to produce macroscopic assembly of single-wall carbon **nanotubes**, which can be utilized for electrical, chemical, mechanical, and biological applications. It can be utilized to form materials that can be used for high strength fibers and cables, electrical transmission lines, structural materials, impact-resistant materials, armor, structural laminates having layers with different tube orientations, pressure vessel exteriors and reinforcement, thermal management materials (e.g., heat-transporting materials), heat-resistant materials, airframe (components) for aircraft and missiles, vehicle bodies, ship hulls, chemically inert materials, electrochemical electrodes, battery electrodes, catalyst supports, biologically-inert materials, sensors, and materials that absorb, support and dispense moieties that intercalate, and transducer elements.
ADVANTAGE - The method allows the single-wall carbon **nano-tubes** to be aligned in the same direction, thus capable of forming macroscopic ordered assembly of carbon **nanotubes** having remarkable physical, electrical, and chemical properties.
Dwg.0/16

FS CPI EPI
FA AB; DCN
MC CPI: A08-R03A; E05-U02; H04-B02; H04-C; H04-E08; H04-F02B; H04-F02C; H04-F02E; J04-E03; L03-E01B; L03-J; N05-E03; N06-F
EPI: U12-B03X

L39 ANSWER 23 OF 60 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2001-425043 [45] WPIX
DNN N2001-315356 DNC C2001-128534
TI Preparing patterned layer of aligned carbon **nanotubes** on substrate for semiconductors, includes applying polymeric material pattern on substrate using soft lithographic technique, carbonizing or synthesizing aligned carbon **nanotubes** layer.
DC A35 A89 E12 E36 L03 U11 U12
IN DAI, L; HUANG, S; MAU, A
PA (CSIR) COMMONWEALTH SCI & IND RES ORG
CYC 95
PI WO 2001021863 A1 20010329 (200145)* EN 26p C30B029-66
RW: AT BE CH CY DE DK EA ES FI FR GB GH GM GR IE IT KE LS LU MC MW MZ NL OA PT SD SE SL SZ TZ UG ZW
W: AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CR CU CZ DE DK DM DZ EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NO NZ PL PT RO RU SD SE

SG SI SK SL TJ TM TR TT TZ UA UG US UZ VN YU ZA ZW
AU 2000076340 A 20010424 (200145) C30B029-66
EP 1230448 A1 20020814 (200261) EN C30B029-66
R: AL AT BE CH CY DE DK ES FI FR GB GR IE IT LI LT LU LV MC MK NL PT RO SE SI
JP 2003510236 W 20030318 (200321) 29p C01B031-02 <--
ADT WO 2001021863 A1 WO 2000-AU1180 20000922; AU 2000076340 A AU 2000-76340 20000922; EP 1230448 A1 EP 2000-965658 20000922, WO 2000-AU1180 20000922; JP 2003510236 W WO 2000-AU1180 20000922, JP 2001-525017 20000922
FDT AU 2000076340 A Based on WO 2001021863; EP 1230448 A1 Based on WO 2001021863; JP 2003510236 W Based on WO 2001021863
PRAI AU 1999-3041 19990923
IC ICM **C01B031-02**; C30B029-66
ICS C30B023-04; C30B029-02
AB WO 200121863 A UPAB: 20010813
NOVELTY - Preparing a patterned layer of aligned carbon **nanotubes** on a substrates using a soft lithographic technique.
DETAILED DESCRIPTION - Preparing a patterned layer of aligned carbon **nanotubes** on a substrate including:
(a) applying a pattern of polymeric material on the surface of a substrate capable of supporting **nanotube** capable of supporting **nanotube** growth using a soft lithographic technique;
(b) subjecting the polymeric material to carbonization to form a patterned layer of carbonized polymer on the surface of the substrate; or
(c) synthesizing a layer of aligned carbon **nanotubes** on regions of the substrate to which carbonized polymer is not attached to provide a patterned layer of aligned carbon **nanotubes** on the substrate.
INDEPENDENT CLAIMS are also included for:
(1) a patterned carbon **nanotube** film prepared using the claimed method;
(2) a device comprising a patterned carbon **nanotube** film prepared by the claimed method; and
(3) a photovoltaic cell comprising a patterned carbon **nanotube** film prepared by the claimed method.
USE - Used for photonic and electronic devices for use as electron field emitters in panel displays, single molecular transistors, scanning probe microscope tips, gas electrochemical energy storages, catalyst and proteins/DNA supports, artificial actuators, chemical sensors, molecular filtration **membranes**, energy absorbing materials, semiconductors, molecular transistors and other opto-electronic devices.
ADVANTAGE - Allows resolutions up to a sub-micrometer scale.
DESCRIPTION OF DRAWING(S) - Figure 2 is a schematic showing the stages involved in the preparation of a pattern layer of aligned carbon **nanotubes**.
Dwg.2/6
FS CPI EPI
FA AB; GI; DCN
MC CPI: A10-E05B; A11-B05; A12-E07C; A12-L02B2; E05-U; E05-U02; L04-C06; N02-A; N02-C01; N04-A; N05-B; N05-C
EPI: U11-C04A7; U12-B03X

L39 ANSWER 24 OF 60 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2002-390432 [42] WPIX
DNC C2002-109962
TI Production of carbon **nanotube**-based emitter using electrochemical polymerization.
DC A35 E36

IN JIN, Y W
PA (SMSU) SAMSUNG SDI CO LTD
CYC 1
PI KR 2001107273 A 20011207 (200242)* 1p C01B031-02 <--
KR 366705 B 20030109 (200338) C01B031-02 <--
ADT KR 2001107273 A KR 2000-28657 20000526; KR 366705 B KR 2000-28657 20000526
FDT KR 366705 B Previous Publ. KR 2001107273
PRAI KR 2000-28657 20000526
IC ICM **C01B031-02**
AB KR2001107273 A UPAB: 20020704
NOVELTY - A process of preparing an emitter based on carbon **nanotubes** by mixing polymer precursors and carbon **nanotubes** with a mixed method of electrophoresis and electrochemical polymerization, dispersing in a solution and applying electric energy is provided, which can be effectively used in production of an element. A carbon **nanotube membrane** or a carbon **nanotube**/polymer complex obtained by the process can be applied to the emission source of an electron gun of displays or formation of microwave elements.
DETAILED DESCRIPTION - Powdery carbon **nanotubes**, electrochemically polymerizable monomers and electrolytes are dispersed in a solvent to produce a carbon **nanotube** dispersion, an anode and cathode are disposed in the dispersion and a specified current and voltage are then applied thereto, thereby carrying out electrochemical polymerization to form a carbon **nanotube membrane** or a carbon **nanotube**/polymer complex on a the positive and negative poles.
Dwg.1/10
FS CPI
FA AB; GI
MC CPI: A10-B; A10-D06; A12-E; A12-E11; E05-U02; E31-N03

L39 ANSWER 25 OF 60 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2001-412117 [44] WPIX
DNC C2001-124791
TI Manufacture of carbon **nano tube** for electronic material, involves contacting carbide with reactive gas containing halogen.
DC E36 L02 L03
PA (TOKE) TOSHIBA KK
CYC 1
PI JP 2001048507 A 20010220 (200144)* 5p C01B031-02 <--
JP 3335330 B2 20021015 (200275) 5p C01B031-02 <--
ADT JP 2001048507 A JP 1999-225487 19990809; JP 3335330 B2 JP 1999-225487 19990809
FDT JP 3335330 B2 Previous Publ. JP 2001048507
PRAI JP 1999-225487 19990809
IC ICM **C01B031-02**
AB JP2001048507 A UPAB: 20010809
NOVELTY - A carbide is reacted with a halogen-containing reactive gas (10) which removes all elements (except carbon) and forms carbon **nano tubes** (13).
DETAILED DESCRIPTION - An INDEPENDENT CLAIM is also included for manufacture of carbon **nano tube** film. A base material having a carbide film on its surface is prepared, and the carbide film contacted with a reactive gas.
USE - For electronic material and as a substance separation **membrane**.

ADVANTAGE - Carbon **nano tube** and carbon **nano tube** film are effectively manufactured in high yield at low temperature.

DESCRIPTION OF DRAWING(S) - The figure shows the formation of carbon **nano tube** film.

Gas containing halogen 10

Carbon **nano tube** 13

Dwg.1/2

FS CPI

FA AB; GI; DCN

MC CPI: E05-U02; E31-N03; L02-H04; L03-D01

L39 ANSWER 26 OF 60 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 2000:881397 HCAPLUS

DN 134:44585

ED Entered STN: 15 Dec 2000

TI Method and metal doped carbon system for reversibly storing hydrogen

IN Chen, Ping; Lin, Jianyi

PA National University of Singapore, Singapore; Tan, Kuang, Lee

SO PCT Int. Appl., 29 pp.

CODEN: PIXXD2

DT Patent

LA English

IC ICM F17C011-00

ICS B01J020-20; C01B003-00

CC 52-3 (Electrochemical, Radiational, and Thermal Energy Technology)

Section cross-reference(s): 49, 57

FAN.CNT 2

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	WO 2000075559	A1	20001214	WO 2000-SG58	20000425
	W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM				
	RW: GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG				
	US 6471936	B1	20021029	US 2000-517057	20000302
PRAI	SG 1999-2930	A	19990604		
	US 2000-517057	A	20000302		

AB Hydrogen is reversibly stored by exposure of a solid sorbent comprising a metal-doped carbon-based material, e.g., alkali metal-doped activated **carbon, carbon** fibers or **carbon nanotubes,** to a hydrogen atmospheric at 250-973 K under ambient or higher pressure. The alkali metal-doped carbon-based material is prepared by mixing a carbon material with an alkali metal salt and calcining the mixture under an atmospheric of inert or reductive gas.

ST hydrogen storage system metal doped carbon adsorbent

IT **Nanotubes**

RL: DEV (Device component use); **SPN (Synthetic preparation)**; TEM (Technical or engineered material use); **PREP (Preparation)**; USES (Uses)

(**carbon, nanocones**; method and metal doped **carbon** system for reversibly storing hydrogen)

IT Adsorbents

Adsorption
Decomposition catalysts
Dopants
Energy storage systems
(method and **metal** doped carbon system for reversibly storing hydrogen)

IT Alkali metals, uses
RL: MOA (Modifier or additive use); USES (Uses)
(method and metal doped carbon system for reversibly storing hydrogen)

IT Alkali metal salts
Carbonates, uses
Halides
Hydrides
Hydroxides (inorganic)
Nitrates, uses
Nitrites
RL: NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(method and metal doped carbon system for reversibly storing hydrogen)

IT **Carbon** fibers, uses
RL: DEV (Device component use); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(**nanofibers**; method and metal doped **carbon** system for reversibly storing hydrogen)

IT 7440-44-0, Carbon, uses
RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
(activated; method and metal doped carbon system for reversibly storing hydrogen)

IT 7439-89-6, Iron, uses 7440-02-0, Nickel, uses 7440-48-4, Cobalt, uses
RL: CAT (Catalyst use); USES (Uses)
(method and metal doped carbon system for reversibly storing hydrogen)

IT 7439-93-2, Lithium, uses 7440-09-7, Potassium, uses 7440-17-7, Rubidium, uses 7440-23-5, Sodium, uses 7440-46-2, Cesium, uses
RL: MOA (Modifier or additive use); USES (Uses)
(method and metal doped carbon system for reversibly storing hydrogen)

IT 64-19-7D, Acetic acid, alkali metal salts, uses 1310-58-3, Potassium hydroxide, uses 1310-73-2, Sodium hydroxide, uses 7790-69-4, Lithium nitrate 10377-51-2, Lithium iodide
RL: NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(method and metal doped carbon system for reversibly storing hydrogen)

IT 1333-74-0, Hydrogen, uses
RL: NUU (Other use, unclassified); TEM (Technical or engineered material use); USES (Uses)
(method and metal doped carbon system for reversibly storing hydrogen)

IT 74-82-8, Methane, reactions
RL: PEP (Physical, engineering or chemical process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)
(method and metal doped carbon system for reversibly storing hydrogen)

RE.CNT 2 THERE ARE 2 CITED REFERENCES AVAILABLE FOR THIS RECORD
RE
(1) Mannesmann Ag; DE 19745549 A1 1999
(2) Studiengesellschaft, K; EP 0112548 A1 1987 HCAPLUS

L39 ANSWER 27 OF 60 HCAPLUS COPYRIGHT 2004 ACS on STN
AN 2000:628083 HCAPLUS
DN 133:225136

ED Entered STN: 10 Sep 2000
TI **Carbon nanotubes** for battery electrodes
IN Zhou, Otto Z.; Gao, Bo
PA University of North Carolina - Chapel Hill, USA
SO PCT Int. Appl., 26 pp.
CODEN: PIXXD2
DT Patent
LA English
IC ICM C01B
CC 49-1 (Industrial Inorganic Chemicals)
Section cross-reference(s): 52, 57
FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	WO 2000051936	A2	20000908	WO 2000-US3704	20000224
	WO 2000051936	A3	20010104		
	W: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM				
	RW: GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG				
	US 6280697	B1	20010828	US 1999-259307	19990301
	AU 2000052656	A5	20000921	AU 2000-52656	20000224
	EP 1165440	A2	20020102	EP 2000-937496	20000224
	R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO				
	JP 2002538066	T2	20021112	JP 2000-602167	20000224
	US 6422450	B1	20020723	US 2000-662547	20000915
PRAI	US 1999-259307	A	19990301		
	WO 2000-US3704	W	20000224		

AB A carbon-based material containing an allotrope of **carbon**, especially single-walled **carbon nanotubes**, is capable of accepting an **intercalated** alkali **metal**. The material exhibits a reversible capacity ranging from approx. 650-1000 mAh/g. The high capacity of the material makes it attractive for a number of applications, such as a battery electrode material. The single-walled **carbon nanotube** material can be produced by laser ablation of a graphite target, followed by purifying the recovered nanotube material, and depositing the purified material onto a conductive substrate. The coated substrate is incorporated into an electrochem. cell, and its ability to accept **intercalated** materials, such as an alkali **metal** (e.g., lithium) is measured.

ST **carbon nanotube** battery electrode; lithium battery electrode **carbon nanotube**
IT Battery anodes
Battery electrodes
Laser ablation
(**carbon nanotubes** for battery electrodes)
IT Alkali metals, uses
Carbon black, uses
RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
(**carbon nanotubes** for battery electrodes)
IT Alcohols, processes

RL: NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(**carbon nanotubes** for battery electrodes)

IT **Nanotubes**
RL: DEV (Device component use); **SPN (Synthetic preparation)**; TEM (Technical or engineered material use); **PREP (Preparation)**; USES (Uses)
(**carbon**, single-walled; **carbon nanotubes** for battery electrodes)

IT Intercalation
(electrochem.; **carbon nanotubes** for battery electrodes)

IT Secondary batteries
(lithium; **carbon nanotubes** for battery electrodes)

IT 7439-93-2, Lithium, uses 7440-02-0, Nickel, uses 7440-50-8, Copper, uses
RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
(electrodes; **carbon nanotubes** for battery electrodes)

IT 7440-44-0P, **Carbon**, preparation 7782-42-5P, Graphite, preparation
RL: DEV (Device component use); **SPN (Synthetic preparation)**; TEM (Technical or engineered material use); **PREP (Preparation)**; USES (Uses)
(**nanotubes**; **carbon nanotubes** for battery electrodes)

L39 ANSWER 28 OF 60 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2001-158998 [16] WPIX
DNN N2001-115897 DNC C2001-047114
TI Preparation of substrate-supported aligned carbon **nanotube** film for constructing devices includes synthesizing layer of aligned carbon **nanotubes** on substrate.
DC A85 A88 A89 E36 F01 J01 J04 L02 L03 U11 U12
IN DAI, L; HUANG, S; MAU, A; SHAOMING, H
PA (CSIR) COMMONWEALTH SCI & IND RES ORG
CYC 95
PI WO 2000073204 A1 20001207 (200116)* EN 19p C01B031-02 <--
RW: AT BE CH CY DE DK EA ES FI FR GB GH GM GR IE IT KE LS LU MC MW MZ NL OA PT SD SE SL SZ TZ UG ZW
W: AE AG AL AM AT AU AZ BA BB BG BR BY CA CH CN CR CU CZ DE DK DM DZ EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NO NZ PL PT RO RU SD SE SG SI SK SL TJ TM TR TT TZ UA UG US UZ VN YU ZA ZW
AU 2000045284 A 20001218 (200118)
EP 1198414 A2 20020424 (200235) EN C01B031-02 <--
R: AL AT BE CH CY DE DK ES FI FR GB GR IE IT LI LT LU LV MC MK NL PT RO SI
JP 2003500325 W 20030107 (200314) 23p C01B031-02 <--
TW 499395 A 20020821 (200333) C01B031-02 <--
AU 759314 B 20030410 (200337) C01B031-02 <--
ADT WO 2000073204 A1 WO 2000-AU550 20000525; AU 2000045284 A AU 2000-45284 20000525; EP 1198414 A2 EP 2000-926581 20000525, WO 2000-AU550 20000525; JP 2003500325 W JP 2000-621280 20000525, WO 2000-AU550 20000525; TW 499395 A TW 2000-110217 20000526; AU 759314 B AU 2000-45284 20000525
FDT AU 2000045284 A Based on WO 2000073204; EP 1198414 A2 Based on WO 2000073204; JP 2003500325 W Based on WO 2000073204; AU 759314 B Previous

Publ. AU 2000045284, Based on WO 2000073204
PRAI AU 1999-650 19990528
IC ICM **C01B031-02**
ICS C30B029-02; C30B029-66; D01F009-12; D01F009-127
AB WO 200073204 A UPAB: 20010323
NOVELTY - A substrate supported aligned carbon **nanotube** film is prepared by synthesizing a layer of the aligned carbon **nanotube** on a substrate. A layer of a second substrate is applied on the top of the aligned layer. The substrate is then removed to provide an aligned carbon **nanotube** film.
USE - For constructing multilayered structures or devices (claimed). The devices have practical applications in many areas including electron field emitters, artificial actuators, chemical sensors, gas storage, molecular-filtration **membranes**, **nanotube** capacitors, energy-absorbing materials, molecular transistors and other optoelectronic devices.
ADVANTAGE - The carbon **nanotube** film can be transferred from the substrate on which they are synthesized to other substrate. The tube can also be readily peeled off from the substrate.
Dwg.0/4
FS CPI EPI
FA AB; DCN
MC CPI: A11-B05A; A11-C02C; E05-U02; F01-D; F01-E; F04-E; J01-H; L02-H04; L03-H; N01-C; N02; N02-A01; N02-B01; N02-C; N02-F02; N03-D01; N03-E
EPI: U11-C18C; U12-B03D; U12-B03F; U12-B03X

L39 ANSWER 29 OF 60 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2001-102322 [11] WPIX
DNN N2001-076001 DNC C2001-029830
TI New photolithographic process for preparing patterned layer of aligned carbon **nanotubes** comprises forming carbon **nanotubes** on a photoresist material applied onto a substrate and electromagnetically radiating the material.
DC A18 A21 A26 A85 E19 G06 J01 J04 J06 L03 U11 U12
IN DAI, L; HE, H Z; HUANG, S; MAU, A; YANG, Y Y
PA (CSIR) COMMONWEALTH SCI & IND RES ORG
CYC 94
PI WO 2000073203 A1 20001207 (200111)* EN 26p C01B031-02 <--
RW: AT BE CH CY DE DK EA ES FI FR GB GH GM GR IE IT KE LS LU MC MW MZ NL OA PT SD SE SL SZ TZ UG ZW
W: AE AG AL AM AT AU AZ BA BB BG BR BY CA CH CN CR CU CZ DE DK DM DZ EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NO NZ PL PT RO RU SD SE SG SI SK SL TJ TM TR TT TZ UA UG US UZ VN YU ZA ZW
AU 2000045283 A 20001218 (200118) C01B031-02 <--
EP 1200341 A1 20020502 (200236) EN C01B031-02 <--
R: AL AT BE CH CY DE DK ES FI FR GB GR IE IT LI LT LU LV MC MK NL PT RO SE SI
AU 753177 B 20021010 (200279) C01B031-02 <--
JP 2003500324 W 20030107 (200314) 25p C01B031-02 <--
ADT WO 2000073203 A1 WO 2000-AU549 20000525; AU 2000045283 A AU 2000-45283 20000525; EP 1200341 A1 EP 2000-926580 20000525, WO 2000-AU549 20000525; AU 753177 B AU 2000-45283 20000525; JP 2003500324 W JP 2000-621279 20000525, WO 2000-AU549 20000525
FDT AU 2000045283 A Based on WO 2000073203; EP 1200341 A1 Based on WO 2000073203; AU 753177 B Previous Publ. AU 2000045283, Based on WO 2000073203; JP 2003500324 W Based on WO 2000073203
PRAI AU 1999-649 19990528

IC ICM **C01B031-02**
ICS D01F009-12; D01F009-127
AB WO 200073203 A UPAB: 20010224
NOVELTY - Preparing a patterned layer of aligned carbon **nanotubes** on a substrate comprises applying a layer of photoresist (1) to the substrate, suitably masking the layer, subjecting the unmasked portion of (1) to electromagnetic radiation, developing (1) with a solvent to dissolve either transformed or untransformed portion and synthesizing the layer of carbon **nanotubes** on the remaining portion of (1).

DETAILED DESCRIPTION - Preparing a patterned layer of aligned carbon **nanotubes** on a substrate comprises:

(a) applying a layer of photoresist (1) to at least a portion of a surface of the substrate capable of supporting the **nanotube** growth;

(b) masking a region of the layer of (1) to provide a masked and unmasked portions;

(c) subjecting the unmasked portion of (1) to an electromagnetic radiation having a wavelength and intensity to transform the unmasked portion, while leaving the masked portion untransformed. The transformed portion exhibits solubility characteristics different then that of the untransformed portion;

(d) developing the layer of (1) by contacting with a solvent for a time and under conditions to dissolve either the transformed or untransformed portions of (1) and leave the other portion attached to the substrate; and

(e) synthesizing the patterned layer of aligned carbon **nanotubes** on the regions of the substrate to which the remaining portion of (1) is not attached.

INDEPENDENT CLAIMS are also included for:

(1) patterned carbon **nanotubes** film prepared by the process; and

(2) a device comprising the patterned carbon **nanotube** film.

USE - Useful in electron emitters in panel displays, field-emission transistors, single-molecular transistors, electrodes for photovoltaic cells and light emitting diodes with region-specific characteristics, optoelectronic elements, bismuth actuators, chemical and biological sensors with region-specific characteristic, molecular filtration **membranes**, region-specific energy absorbing materials, gas and electrochemical energy storage and catalyst and proteins/DNA supports.

ADVANTAGE - The process is easy to perform and provides a convenient route to patterned aligned carbon **nanotubes** with controllable geometries. The process allows formation of carbon **nanotubes** on various substrates with a micrometer or submicrometer resolution.

Dwg.0/4
FS CPI EPI
FA AB; DCN
MC CPI: A12-E01; A12-L02B2; E05-U02; G06-D06; G06-E02; G06-E04; G06-F03C; G06-G17; G06-G18; J01-C03; J04-B01; J04-C04; J04-E04; J06-B06; L04-C06; L04-C06B; L04-E; N01-C; N02-A01; N02-B01; N02-C01; N02-F02; N03-D01; N03-E; N05-B
EPI: U11-A06A; U11-C04E; U12-B03X

L39 ANSWER 30 OF 60 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2001-024557 [03] WPIX
DNN N2001-019225 DNC C2001-007359
TI Preparation of substrate-free aligned **nanotube** film used in electron emitters, involves forming aligned carbon **nanotube** layer on quartz glass by pyrolysis of carbon containing material using

catalyst and etching.
DC E12 E36 J01 J04 J06 L03 U11 U12
IN DAI, L; HUANG, S
PA (CSIR) COMMONWEALTH SCI & IND RES ORG
CYC 94
PI WO 2000063115 A1 20001026 (200103)* EN 22p C01B031-02 <--
RW: AT BE CH CY DE DK EA ES FI FR GB GH GM GR IE IT KE LS LU MC MW NL
OA PT SD SE SL SZ TZ UG ZW
W: AE AG AL AM AT AU AZ BA BB BG BR BY CA CH CN CR CU CZ DE DK DM DZ
EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK
LR LS LT LU LV MA MD MG MK MN MW MX NO NZ PL PT RO RU SD SE SG SI
SK SL TJ TM TR TT TZ UA UG US UZ VN YU ZA ZW
AU 2000036496 A 20001102 (200107)
EP 1183210 A1 20020306 (200224) EN C01B031-02 <--
R: AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
CN 1349478 A 20020515 (200260) C01B031-02 <--
KR 2002024580 A 20020330 (200266) C01B031-02 <--
JP 2002542136 W 20021210 (200301) 23p C01B031-02 <--
TW 483870 A 20020421 (200314) C01B031-02 <--
ZA 2001008303 A 20030326 (200327) 27p C01B000-00
AU 764152 B 20030814 (200363) C01B031-02 <--
ADT WO 2000063115 A1 WO 2000-AU324 20000414; AU 2000036496 A AU 2000-36496 20000414; EP 1183210 A1 EP 2000-915051 20000414, WO 2000-AU324 20000414; CN 1349478 A CN 2000-807016 20000414; KR 2002024580 A KR 2001-712977 20011012; JP 2002542136 W JP 2000-612216 20000414, WO 2000-AU324 20000414; TW 483870 A TW 2000-107194 20000415; ZA 2001008303 A ZA 2001-8303 20011009; AU 764152 B AU 2000-36496 20000414
FDT AU 2000036496 A Based on WO 2000063115; EP 1183210 A1 Based on WO 2000063115; JP 2002542136 W Based on WO 2000063115; AU 764152 B Previous Publ. AU 2000036496, Based on WO 2000063115
PRAI AU 1999-9764 19990416
IC ICM C01B000-00; **C01B031-02**
ICS D01F009-12; D01F009-127
AB WO 200063115 A UPAB: 20010116
NOVELTY - The method involves synthesizing a layer of aligned carbon **nanotube** on a quartz glass substrate by pyrolysis of carbon containing material in presence of catalyst and etching quartz glass substrate at **nanotube**/substrate interface to release layer of aligned **nanotubes** from the substrate.

DETAILED DESCRIPTION - INDEPENDENT CLAIMS are also included for:

(i) the preparation of multilayer carbon **nanotube** film, involving forming a **nanotube** coated substrate and synthesizing further layer of aligned carbon **nanotubes** on the coated substrate by the pyrolysis of carbon containing material in presence of a catalyst;

(ii) the preparation of substrate-free hetero-structured multilayer carbon **nanotube** film, involving synthesizing a layer of aligned carbon **nanotube** on a metal, metal oxide or semiconductor coated quartz glass substrate and the substrate is etched at the quartz/metal surface to release hetero-structured multilayer film from the quartz glass; and

(iii) the preparation of hetero-structured multilayer carbon **nanotube** comprising intercalating a substrate-free aligned carbon **nanotube** film into a multilayer structure.

USE - Used in electron emitters, gas storages, field emission transistors, electrodes for photovoltaic cells and light emitting diodes, optoelectronic elements, bismuth actuators, chemical and biological sensors, molecular filtration **membranes** and energy absorbing

materials.
ADVANTAGE - The manufacture of multilayer carbon **nanotube** materials with controllable layer thickness, diameter and packing density of constituent **nanotubes** in each of the layers is enabled.
Dwg.0/4
FS CPI EPI
FA AB; DCN
MC CPI: E05-U02; E31-N03; J01-C03; J01-E02C; J01-E03E; J04-B01; J04-C04; J06-B06; L04-E01A; L04-E03A; L04-E05D; N01-C; N02-A01; N02-B01; N02-C01; N02-F02; N03-D01; N03-E
EPI: U11-C01J2; U12-A01A1X; U12-A02A2F; U12-B03D; U12-B03X

L39 ANSWER 31 OF 60 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2000-344832 [30] WPIX
DNC C2000-104904
TI Manufacturing carbon **nanotube** for electron emission and gas separation **membrane** - involves heating silicon carbide thin film in inert gas containing oxygen and subsequently under vacuum.
DC E36 J01 L03
PA (FINE-N) ZH FINE CERAMICS CENT
CYC 1
PI JP 2000109308 A 20000418 (200030)* 5p C01B031-02 <--
ADT JP 2000109308 A JP 1998-282214 19981005
PRAI JP 1998-282214 19981005
IC ICM **C01B031-02**
ICS B01D071-02; C30B025-18; C30B029-36; C30B029-66; C30B033-02
AB JP2000109308 A UPAB: 20000630
NOVELTY - A silicon carbide single crystal thin film formed by the epitaxial growth of SiC crystal on a silicon single crystal substrate is immersed in an etching fluid and etching is performed to separate the thin film from the substrate. The SiC single crystal thin film is heated at high temperature in an inert atmosphere containing oxygen to produce carbon **nano tube** film.
USE - For the manufacture of carbon **nano tube** thin film used as a source of electron emission and as gas separation **membrane**.
ADVANTAGE - A carbon **nano tube** of various surface shape, large area having high electron emission ability is obtained. Economical and highly efficient flat surface displays and gas separation **membranes** can be formed. **Nano tubes** which forms precise sequence can be manufactured easily.
DESCRIPTION OF DRAWING - The figure shows an explanatory drawing of the manufacture of carbon **nano tube**. (1) Silicon carbide single crystal; (2) Carbon **nano tube**; (3) Silicon wafer; (4) Silicon carbide film.
Dwg.2/3
FS CPI
FA AB; GI
MC CPI: E31-N03; J04-A04; L02-H04

L39 ANSWER 32 OF 60 HCAPLUS COPYRIGHT 2004 ACS on STN
AN 2000:607985 HCAPLUS
DN 133:338873
ED Entered STN: 01 Sep 2000
TI Well-aligned **carbon nanotube array** **membrane** synthesized in **porous** alumina template by chemical vapor deposition
AU Wang, Chengwei; Li, Menke; Pan, Shanlin; Li, Hulin

CS Department of Chemistry, Lanzhou University, Lanzhou, 730000, Peop. Rep. China
SO Chinese Science Bulletin (2000), 45(15), 1373-1376
CODEN: CSBUEF; ISSN: 1001-6538
PB Science in China Press
DT Journal
LA English
CC 57-8 (Ceramics)
AB A new simple approach was developed for preparing well-aligned and monodispersed **carbon nanotube** (CNT) **array** membrane within the cylindrical pores of anodic aluminum oxide (AAO) template by chemical vapor deposition (CVD). Acetylene and hydrogen were used in the CVD process with Fe-catalyzer at 700°C under 250 Pa. Scanning electron microscope (SEM) and transmission electron microscope (TEM) were employed to characterize the resulting highly-oriented uniform hollow tube **array** which had a diameter of about 250 nm, a tube d. of 5.3 + 108 cm2 and a length of .apprx.60 μm. The length and diameter of the tubes depend on the thickness and pore diameter of the template.

The growth properties of the CNT **array** film can be achieved by controlling the structure of the template, the particle size of Fe-catalyzer, the temperature in the reactor, the flow ratio and the deposition time. The highly-oriented and uniform CNT **array** membranes fabricated by this simple method should find use in a variety of applications.
ST **carbon nanotube array** CVD prepn porous alumina template; **membrane carbon nanotube array** CVD prepn **porous** alumina template

IT Particle size
(CVD preparation of **carbon nanotube array membrane** in **porous** anodic alumina template)

IT **Nanostructures**
(**carbon nanotube array membrane** ; CVD preparation of **carbon nanotube array membrane** in **porous** anodic alumina template)

IT **Membranes**, nonbiological
(**carbon nanotube array**; CVD preparation of **carbon nanotube array membrane** in **porous** anodic alumina template)

IT **Nanotubes**
RL: PEP (Physical, engineering or chemical process); PRP (Properties); **SPN (Synthetic preparation)**; **PREP (Preparation)**; PROC (Process)
(**carbon, arrays, membranes**; CVD preparation of **carbon nanotube array membrane** in **porous** anodic alumina template)

IT Vapor deposition process
(chemical; CVD preparation of **carbon nanotube array membrane** in **porous** anodic alumina template)

IT 1344-28-1P, Aluminum oxide (Al2O3), preparation
RL: NUU (Other use, unclassified); **SPN (Synthetic preparation)**; **PREP (Preparation)**; USES (Uses)
(anodic, template; CVD preparation of **carbon nanotube array membrane** in **porous** anodic alumina template)

IT 74-86-2, Acetylene, processes
RL: PEP (Physical, engineering or chemical process); PROC (Process)
(**carbon** source; CVD preparation of **carbon**

nanotube array membrane in **porous** anodic alumina template)

IT 7439-89-6, Iron, uses
RL: CAT (Catalyst use); USES (Uses)
(catalyst; CVD preparation of **carbon nanotube array membrane** in **porous** anodic alumina template)

IT 7440-44-0P, **Carbon**, preparation
RL: PEP (Physical, engineering or chemical process); PRP (Properties); **SPN (Synthetic preparation)**; **PREP (Preparation)**; PROC (Process)
(**nanotube array membrane**; CVD preparation of **carbon nanotube array membrane** in **porous** anodic alumina template)

RE.CNT 13 THERE ARE 13 CITED REFERENCES AVAILABLE FOR THIS RECORD

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L39 ANSWER 33 OF 60 HCAPLUS COPYRIGHT 2004 ACS on STN
AN 2000:760086 HCAPLUS
DN 134:80046
ED Entered STN: 30 Oct 2000
TI Doping of **carbon nanotubes** by heavy alkali metals
AU Duclaux, L.; Metenier, K.; Salvetat, J. P.; Lauginie, P.; Bonnamy, S.; Beguin, F.
CS CRMD, CNRS-University, Orleans, 45071, Fr.
SO Molecular Crystals and Liquid Crystals Science and Technology, Section A: Molecular Crystals and Liquid Crystals (2000), 340, 769-774
CODEN: MCLCE9; ISSN: 1058-725X
PB Gordon & Breach Science Publishers
DT Journal
LA English
CC 78-3 (Inorganic Chemicals and Reactions)
AB Multiwall (MWNT) and single wall (SWNT) **carbon nanotubes** were **intercalated** with heavy alkali **metals**. From the point of view of their composition, alkali 2-dimensional superlattice, EPR and 13C NMR characteristics, the intercalation compds. of MWNT (1st and 2nd stage) are close to their parent GIC. An expansion of the 2-dimensional triangular lattice of SWNT bundles was clearly detected, showing that the alkali atoms are intercalated in the free space between the tubes.
ST **carbon nanotube** alkali **metal intercalation**
IT **Nanotubes**
RL: RCT (Reactant); RACT (Reactant or reagent)
(**carbon**; intercalation of **carbon nanotubes**

with heavy alkali metals)
IT Intercalation
(intercalation of **carbon nanotubes** with heavy alkali metals)
IT Alkali **metals**, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(**intercalation** of **carbon nanotubes** with heavy alkali metals)
IT 7440-09-7, Potassium, reactions 7440-17-7, Rubidium, reactions
7440-46-2, Cesium, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(intercalation of **carbon nanotubes** with heavy alkali metals)
IT 7440-44-0DP, **Carbon**, alkali **metal intercalated**
, preparation
RL: PRP (Properties); **SPN (Synthetic preparation); PREP (Preparation)**
(**nanotubes; intercalation** of **carbon nanotubes** with heavy alkali metals)
RE.CNT 9 THERE ARE 9 CITED REFERENCES AVAILABLE FOR THIS RECORD
RE
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L39 ANSWER 34 OF 60 HCAPLUS COPYRIGHT 2004 ACS on STN
AN 2000:145710 HCAPLUS
DN 132:258623
ED Entered STN: 05 Mar 2000
TI A novel form of carbon nitrides: well-aligned **carbon** nitride **nanotubes** and their characterization
AU Sung, S. L.; Tsai, S. H.; Liu, X. W.; Shih, H. C.
CS Department of Materials Science and Engineering, National Tsing Hua University, Hsinchu, 300, Taiwan
SO Journal of Materials Research (2000), 15(2), 502-510
CODEN: JMREEE; ISSN: 0884-2914
PB Materials Research Society
DT Journal
LA English
CC 76-2 (Electric Phenomena)
Section cross-reference(s): 75
AB Well-aligned C nitride nanotubes were prepared with a **porous** Al2O3 **membrane** as a template when using electron cyclotron resonance (ECR) plasma in a mixture of C2H2 and N2 as the precursor with an applied neg. bias to the graphite sample holder. The hollow structure and good alignment of the nanotubes were verified by field-emission SEM. C nitride nanotubes were transparent when viewed by TEM, which showed that the nanotubes were hollow with a diameter of .apprx.250 nm and a length of .apprx.50-80 μm. The amorphous nature of the nanotubes was confirmed by the absence of crystalline phases arising from selected-area diffraction patterns. Both Auger electron microscopy and XPS spectra indicated that

these nanotubes are composed of N and C. The total N/C ratio is 0.72, which is considerably higher than other forms of C nitrides. No free-C phase was observed in the amorphous C nitride nanotubes. The absorption bands at 1250-1750 cm-1 in FTIR spectroscopy provided direct evidence for N atoms, effectively incorporated within the amorphous C network. Such growth of well-aligned C nitride nanotubes can be controlled by tuning the ECR plasma conditions and the applied neg. voltage to the Al2O3 template.

ST **carbon** nitride **nanotube** electron cyclotron resonance plasma

IT **Nanotubes**
(**carbon** nitride; preparation and characterization of well-aligned **carbon** nitride **nanotubes**)

IT Auger electron microscopy
Composition
Field emission
IR spectra
Microstructure
X-ray photoelectron spectra
(preparation and characterization of well-aligned **carbon** nitride **nanotubes**)

IT 154769-61-6P, Carbon nitride
RL: PEP (Physical, engineering or chemical process); PNU (Preparation, unclassified); PRP (Properties); TEM (Technical or engineered material use); **PREP (Preparation)**; PROC (Process); USES (Uses)
(preparation and characterization of well-aligned **carbon** nitride **nanotubes**)

IT 74-86-2, Acetylene, processes 7727-37-9, Nitrogen, processes
RL: PEP (Physical, engineering or chemical process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)
(preparation and characterization of well-aligned **carbon** nitride **nanotubes**)

IT 1344-28-1, Alumina, processes
RL: NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(preparation and characterization of well-aligned **carbon** nitride **nanotubes** on an alumina template)

RE.CNT 47 THERE ARE 47 CITED REFERENCES AVAILABLE FOR THIS RECORD

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L39 ANSWER 35 OF 60 HCAPLUS COPYRIGHT 2004 ACS on STN
AN 2001:82420 HCAPLUS
DN 134:335639
ED Entered STN: 05 Feb 2001
TI **Intercalation** of heavy alkali **metals** (K, Rb and Cs) in the bundles of single wall nanotubes
AU Duclaux, L.; Metenier, K.; Lauginie, P.; Salvetat, J. P.; Bonnamy, S.; Beguin, F.
CS CRMD, CNRS-Universite d'Orleans, Orleans, 45071/2, Fr.
SO AIP Conference Proceedings (2000), 544(Electronic Properties of Novel Materials--Molecular Nanostructures), 408-411
CODEN: APCPCS; ISSN: 0094-243X
PB American Institute of Physics
DT Journal
LA English
CC 78-3 (Inorganic Chemicals and Reactions)
AB The elec.-arc discharge carbon deposits (collaret) containing Single Wall **Carbon Nanotubes** (SWNTs) were heat treated at 1600° for 2 days under N2 flow to eliminate the Ni catalyst by sublimation, without modifications of the SWNTs ropes. Sorting this deposit by gravity enabled obtaining in the coarsest particles a higher amount of SWNTs ropes than in other particle sizes. The coarser particles of the carbon deposits were reacted with the alkali **metals** vapor giving **intercalated** samples with a MC8 composition The intercalation led to an expansion of the 2-dimensional lattice of the SWNTs so that the alkali **metals** were **intercalated** in between the tubes within the bundles. Disordered lattices were observed after intercalation of Rb and Cs. The simulations of the x-ray diffractograms of SWNTs reacted with K, gave the best fit for three K ions occupying the inter-tubes

triangular cavities. The investigations by EPR, and 13C NMR, showed that doped carbon deposits are metallic.

ST alkali **metal intercalated carbon nanotube** prepn; **intercalation** alkali **metal** single wall **carbon nanotube**

IT **Nanotubes**
RL: PRP (Properties); **SPN (Synthetic preparation); PREP (Preparation)**
(**carbon**, alkali **metal intercalated**; **intercalation** of heavy alkali **metals** (K, Rb and Cs) in bundles of single wall **nanotubes**)

IT Alkali **metal** compounds
RL: PRP (Properties); **SPN (Synthetic preparation); PREP (Preparation)**
(**intercalation** compds. with **carbon nanotubes**; **intercalation** of heavy alkali **metals** (K, Rb and Cs) in bundles of single wall **nanotubes**)

IT **Intercalation**
(**intercalation** of heavy alkali **metals** (K, Rb and Cs) in bundles of single wall nanotubes)

IT 7440-09-7, Potassium, reactions 7440-17-7, Rubidium, reactions 7440-46-2, Cesium, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(**intercalation** of heavy alkali **metals** (K, Rb and Cs) in bundles of single wall nanotubes)

RE.CNT 7 THERE ARE 7 CITED REFERENCES AVAILABLE FOR THIS RECORD

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L39 ANSWER 36 OF 60 HCAPLUS COPYRIGHT 2004 ACS on STN
AN 1999:807512 HCAPLUS
DN 132:160246
ED Entered STN: 23 Dec 1999
TI **Metal** Nanowires and **Intercalated Metal** Layers in Single-Walled **Carbon Nanotube** Bundles
AU Govindaraj, A.; Satishkumar, B. C.; Nath, Manashi; Rao, C. N. R.
CS CSIR Centre of Excellence In Chemistry Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore, 560 064, India
SO Chemistry of Materials (2000), 12(1), 202-205
CODEN: CMATEX; ISSN: 0897-4756
PB American Chemical Society
DT Journal
LA English
CC 78-3 (Inorganic Chemicals and Reactions)
AB Nanowires of Au, Ag, Pt, and Pd (1.0-1.4 nm diameter) were produced in the capillaries of single-walled **carbon nanotubes** (SWNTs). The nanowire is single-crystalline in some cases. Dispersions of the nanowires in alc. show longitudinal plasmon absorption bands at different wavelengths, suggesting the presence of a distribution of aspect ratios. A novel phenomenon involving the **intercalation** of **metal**

layers (.apprx.0.5 nm thick) in the intertubular space of SWNT bundles was observed SWNTs decorated by metal nanoparticles are formed in some of the prepns.

ST **carbon nanotube metal nanowire intercalated** prepn; **nanowire** metal filled **carbon nanotube** prepn; gold **nanowire** filled **carbon nanotube** prepn; platinum intercalated filled **carbon nanotube** prepn; palladium **nanowire** filled **carbon nanotube** prepn

IT **Nanotubes**
RL: PRP (Properties); **SPN (Synthetic preparation)**; **PREP (Preparation)**
(**carbon**, metal containing; preparation of **metal** nanowires and **intercalated metal** layers in single-walled **carbon nanotube** bundles)

IT Nanoparticles
(formation of platinum **nanoparticles** on single-walled **carbon nanotube** bundles)

IT Nanowires (**metallic**)
(preparation of **metal** nanowires and **intercalated metal** layers in single-walled **carbon nanotube** bundles)

IT UV and visible spectra
(transverse and longitudinal plasmon absorption bands in electronic absorption spectra of metal **nanowires** in **carbon nanotubes**)

IT 7440-57-5DP, Gold, **carbon nanotube** encapsulated, preparation
RL: PEP (Physical, engineering or chemical process); PRP (Properties); **SPN (Synthetic preparation)**; **PREP (Preparation)**; PROC (Process)
(preparation of gold **nanowires** in **carbon nanotubes**, transverse and longitudinal plasmon absorption bands in electronic absorption spectra and breakup of nanowires upon electron beam exposure)

IT 7440-05-3DP, Palladium, **carbon nanotube** encapsulated, preparation
RL: **SPN (Synthetic preparation)**; **PREP (Preparation)**
(preparation of palladium **nanowires** in **carbon nanotubes**)

IT 7440-06-4DP, Platinum, **carbon nanotube** encapsulated and intercalated, preparation
RL: **SPN (Synthetic preparation)**; **PREP (Preparation)**
(preparation of platinum **nanowires** in **carbon nanotubes**, platinum intercalated **carbon nanotubes** and platinum **nanoparticles** on **carbon nanotubes**)

IT 7440-22-4DP, Silver, **carbon nanotube** encapsulated, preparation
RL: **SPN (Synthetic preparation)**; **PREP (Preparation)**
(preparation of silver **nanowires** in **carbon nanotubes**)

IT 16903-35-8, Tetrachloroauric acid
RL: RCT (Reactant); RACT (Reactant or reagent)
(reactant for preparation of gold **nanowires** in **carbon nanotubes**)

IT 7647-10-1, Palladium dichloride
RL: RCT (Reactant); RACT (Reactant or reagent)

(reactant for preparation of palladium **nanowires** in **carbon nanotubes**)
IT 16941-12-1, Hexachloroplatinic acid
RL: RCT (Reactant); RACT (Reactant or reagent)
(reactant for preparation of platinum **nanowires** in **carbon nanotubes**)
IT 7761-88-8, Silver nitrate, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(reactant for preparation of silver **nanowires** in **carbon nanotubes**)
RE.CNT 18 THERE ARE 18 CITED REFERENCES AVAILABLE FOR THIS RECORD
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L39 ANSWER 37 OF 60 HCAPLUS COPYRIGHT 2004 ACS on STN
AN 2000:894945 HCAPLUS
DN 134:260365
ED Entered STN: 21 Dec 2000
TI Impulse heating an intercalated compound using a 27.12 MHz atmospheric inductively coupled argon plasma to produce nanotubular structures
AU Manning, Thomas J.; Noel, Andrea; Mitchell, Mike; Miller, Angela; Grow, William; Gaddy, Greg; Riddle, Kim; Taylor, Ken; Stach, Joseph
CS Dept. of Chemistry, Valdosta State University, Valdosta, GA, 31698, USA
SO Science and Application of Nanotubes, [Proceedings of Nanotube '99, an International Conference], East Lansing, MI, United States, July 24-27, 1999 (2000), Meeting Date 1999, 169-180. Editor(s): Tomanek, David; Embody, Richard J. Publisher: Kluwer Academic/Plenum Publishers, New York, N. Y.
CODEN: 69ASXC
DT Conference
LA English
CC 78-1 (Inorganic Chemicals and Reactions)
AB Impulse heating of **fluorinated** graphite **intercalation** compds. (C1F0.8, C1F1 and C1F1.1) using an argon ICP produces closed **carbon nanotubes** in the exfoliated graphite. Treating this material with FeCl3 and reheating caused the formation of open nanotubular and nanoencapsulated structures. The use of a covalently bonded graphite intercalation compound (GIC) is essential to the formation of nanotubes by this method.
ST **carbon nanotube** prepn plasma heating graphite fluoride
IT **Nanotubes**

RL: **SPN (Synthetic preparation); PREP (Preparation)**
(**carbon**; impulse heating of **fluorinated** graphite **intercalation** compds. using argon ICP for preparation of **carbon nanotubes**)

IT Inductively coupled plasma
(impulse heating of **fluorinated** graphite **intercalation** compds. using argon ICP for preparation of **carbon nanotubes**)

IT 144913-72-4 145525-66-2, Graphite fluoride (CF1.1) 330995-41-0, Graphite fluoride (CF0.8)
RL: RCT (Reactant); RACT (Reactant or reagent)
(impulse heating of **fluorinated** graphite **intercalation** compds. using argon ICP for preparation of **carbon nanotubes**)

IT 7440-44-0P, **Carbon**, preparation
RL: **SPN (Synthetic preparation); PREP (Preparation)**
(**nanotubes**; impulse heating of **fluorinated** graphite **intercalation** compds. using argon ICP for preparation of **carbon nanotubes**)

IT 7705-08-0, Iron chloride (FeCl3), reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(reaction with closed **carbon nanotubes** to give open **nanotubes** and nanoencapsulates)

RE.CNT 36 THERE ARE 36 CITED REFERENCES AVAILABLE FOR THIS RECORD

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L39 ANSWER 38 OF 60 HCAPLUS COPYRIGHT 2004 ACS on STN
AN 2000:320659 HCAPLUS
DN 133:114004
ED Entered STN: 17 May 2000
TI Intercalation compounds of fullerenes, I: Synthesis, characterization, and solid state properties
AU Yildirim, T.; Zhou, O.; Fischer, J. E.
CS University of Maryland, College Park, MD, 20742, USA
SO Physics and Chemistry of Materials with Low-Dimensional Structures (2000), 23(Physics of Fullerene-Based and Fullerene-Related Materials), 23-66
CODEN: PMLSEO; ISSN: 0924-6339
PB Kluwer Academic Publishers
DT Journal; General Review
LA English
CC 78-0 (Inorganic Chemicals and Reactions)
Section cross-reference(s): 76
AB A review, with 108 refs.,. A review, with 108 refs., is presented in which in three chapters the authors review the intercalation compds. of various new carbon allotropes: C60, C70, and the **carbon nanotubes**. This chapter reviews (1) the structure of C60 solid; (2) the common materials synthesis and characterization techniques that were used to investigate the fullerene compds.; (3) the fullerenes that were intercalated with neutral species. Chapter 3 is devoted to alkali and alkaline-earth **metals intercalated** fullerides. The emphasis is placed on structure and supercond. In particular, the relation between supercond. and various materials parameters are discussed. Chapter 7 summarizes the recent works on (1) rare-earth and lanthanide intercalated fullerides; (2) intercalated C70; (3) **carbon nanotube** intercalation compds.
ST review fullerene **carbon nanotube** intercalation compd; alkali metal fulleride review; supercond alkali metal alkali earth fulleride review; alk earth fulleride review; rare earth fulleride **carbon nanotube** intercalation review
IT Fullerides
RL: PRP (Properties); **SPN (Synthetic preparation); PREP (Preparation)**
(alkali metal; preparation, characterization and solid state properties of intercalation compds. of fullerenes and **carbon nanotubes**)
IT **Nanotubes**
RL: PRP (Properties); **SPN (Synthetic preparation); PREP (Preparation)**
(**carbon**; preparation, characterization and solid state properties of intercalation compds. of fullerenes and **carbon nanotubes**)
IT Fullerenes
Fullerenes
RL: PRP (Properties); **SPN (Synthetic preparation); PREP (Preparation)**
(compds. with alkaline earth metals; preparation, characterization and solid state properties of intercalation compds. of fullerenes and **carbon nanotubes**)
IT Alkaline earth compounds

Alkaline earth compounds
RL: PRP (Properties); **SPN (Synthetic preparation); PREP (Preparation)**
(compds. with fullerenes; preparation, characterization and solid state properties of intercalation compds. of fullerenes and **carbon nanotubes**)

IT Rare earth compounds
Rare earth compounds
RL: PRP (Properties); **SPN (Synthetic preparation); PREP (Preparation)**
(fullerides; preparation, characterization and solid state properties of intercalation compds. of fullerenes and **carbon nanotubes**)

IT Superconductivity
(preparation, characterization and solid state properties of intercalation compds. of fullerenes and **carbon nanotubes**)

IT Fullerenes
Intercalation compounds
RL: PRP (Properties); **SPN (Synthetic preparation); PREP (Preparation)**
(preparation, characterization and solid state properties of intercalation compds. of fullerenes and **carbon nanotubes**)

IT Fullerides
Fullerides
RL: PRP (Properties); **SPN (Synthetic preparation); PREP (Preparation)**
(rare earth; preparation, characterization and solid state properties of intercalation compds. of fullerenes and **carbon nanotubes**)

IT 7440-44-0DP, **Carbon**, intercalation compds., preparation
RL: PRP (Properties); **SPN (Synthetic preparation); PREP (Preparation)**
(**nanotubes**; preparation, characterization and solid state properties of intercalation compds. of fullerenes and **carbon nanotubes**)

IT 99685-96-8DP, C60 Fullerene, intercalation compds. 115383-22-7DP, C70 Fullerene, intercalation compds.
RL: PRP (Properties); **SPN (Synthetic preparation); PREP (Preparation)**
(preparation, characterization and solid state properties of intercalation compds. of fullerenes and **carbon nanotubes**)

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L39 ANSWER 39 OF 60 HCAPLUS COPYRIGHT 2004 ACS on STN
AN 1999:267243 HCAPLUS
DN 130:298903
ED Entered STN: 30 Apr 1999
TI Manufacture of monolayer **carbon nanotubes** by dry process
IN Yamaguchi, Chiharu; Matsumura, Yuji; Matsui, Fumio
PA Osaka Gas Co., Ltd., Japan
SO Jpn. Kokai Tokkyo Koho, 5 pp.
CODEN: JKXXAF
DT Patent
LA Japanese
IC ICM C01B031-02
CC 49-1 (Industrial Inorganic Chemicals)
Section cross-reference(s): 78
FAN.CNT 1

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI JP 11116218	A2	19990427	JP 1997-285360	19971017
PRAI JP 1997-285360		19971017		

AB Monolayer **carbon nanotube** is manufactured by using the

following raw materials: (1) graphite sheets formed using metals of particle size ≤100 nm as nuclei; (2) ≥1 of the following (a) to (c), (a) C containing dispersions of metals of particle size ≤100 nm, (b) composite particles of C and metals of particle size ≤100 nm, and (c) methane and metal (compds.); or (3) ≥1 of the following (d) to (h), (d) metal-dispersed carbon obtained by liquid-layer reaction of C and metal raw materials followed by carbonization, (e) **metal** -plated C, (f) C **intercalated** or doped with **metal**, (g) **metal**-C composite formed by mech. alloying, and (h) metal-C composite particles obtained by plasma treatment of metal and C. The raw materials are also claimed. C nanotubes having uniform diameter and length are prepared at high yield.

ST **carbon nanotube** manuf uniform thickness length; **nanocomposite carbon** metal **nanotube** precursor; mech alloying metal **carbon nanotube** precursor; plasma treatment metal **carbon nanotube** precursor

IT **Nanotubes**
RL: **IMF (Industrial manufacture); PREP (Preparation)**
(**carbon**; manufacture of monolayer **carbon nanotubes** with uniform length and diameter by dry process in presence of metal fine-grain particles)

IT Metals, processes
RL: PEP (Physical, engineering or chemical process); PROC (Process)
(manufacture of monolayer **carbon nanotubes** with uniform length and diameter by dry process in presence of metal fine-grain particles)

IT **Nanocomposites**
Nanoparticles
(metal-dispersed **carbon** particles; **nanotubes** by dry process in presence of metal fine-grain particles)

IT 7440-31-5D, Tin, acetylacetonato complex, processes 7440-48-4D, Cobalt, acetylacetonato complex, processes 15554-47-9, Yttrium acetylacetonate 17272-66-1D, Acetylacetonate, complex, processes
RL: PEP (Physical, engineering or chemical process); PROC (Process)
(manufacture of monolayer **carbon nanotubes** with uniform length and diameter by dry process in presence of metal fine-grain particles)

IT 7440-44-0, Carbon, reactions 7782-42-5, Graphite, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(manufacture of monolayer **carbon nanotubes** with uniform length and diameter by dry process in presence of metal fine-grain particles)

IT 74-82-8, Methane, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(nanotubes by dry process in presence of metal fine-grain particles)

L39 ANSWER 40 OF 60 HCAPLUS COPYRIGHT 2004 ACS on STN
AN 1999:409001 HCAPLUS
DN 131:138254
ED Entered STN: 02 Jul 1999
TI Synthesis of exfoliated graphite from fluorinated graphite using an atmospheric-pressure argon plasma
AU Manning, Thomas J.; Mitchell, Mike; Stach, Joseph; Vickers, Thomas
CS Department of Chemistry, Valdosta State University, Valdosta, GA, 31698, USA
SO Carbon (1999), 37(7), 1159-1164
CODEN: CRBNAH; ISSN: 0008-6223
PB Elsevier Science Ltd.

DT Journal
LA English
CC 78-1 (Inorganic Chemicals and Reactions)
Section cross-reference(s): 57
AB Synthesis of a stable form of exfoliated graphite (EG) is described. EG was prepared from the Graphite **Intercalation** Compound (GIC) **fluorine**-graphite using an atmospheric-pressure 27.12 MHz inductively coupled argon plasma. The fluorinated graphite dust is continuously injected into the argon plasma (5000-8000 K), and collected. Raman spectroscopy and SEM images were used to identify nanotubular structures at the terminals of the EG graphite sheets.
ST exfoliated graphite fluoride prepn nanotube precursor; graphite fluoride exfoliation **carbon nanotube** precursor; **carbon nanotube** precursor exfoliated graphite
IT **Nanotubes**
RL: PNU (Preparation, unclassified); **PREP (Preparation)**
(**carbon**; preparation of exfoliated graphite as potential precursor for **carbon nanotubes**)
IT 7782-42-5P, Graphite, preparation
RL: PRP (Properties); **SPN (Synthetic preparation)**; **PREP (Preparation)**
(exfoliated; preparation of exfoliated graphite as potential precursor for **carbon nanotubes**)
IT 11113-63-6, Graphite fluoride
RL: PEP (Physical, engineering or chemical process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)
(exfoliation of fluorinated graphite to give potential precursor for **carbon nanotubes**)
RE.CNT 42 THERE ARE 42 CITED REFERENCES AVAILABLE FOR THIS RECORD
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L39 ANSWER 41 OF 60 HCAPLUS COPYRIGHT 2004 ACS on STN
AN 1999:712203 HCAPLUS
DN 132:87242
ED Entered STN: 08 Nov 1999
TI Alkali-**metal intercalation** in **carbon nanotubes**
AU Beguin, F.; Duclaux, L.; Metenier, K.; Frackowiak, E.; Salvetat, J. P.; Conard, J.; Bonnamy, S.; Lauginie, P.
CS CNRS-University, Orleans, F-45071, Fr.
SO AIP Conference Proceedings (1999), 486(Electronic Properties of Novel Materials--Science and Technology of Molecular Nanostructures), 273-277
CODEN: APCPCS; ISSN: 0094-243X
PB American Institute of Physics
DT Journal
LA English
CC 78-3 (Inorganic Chemicals and Reactions)
AB The authors report on successful intercalation of multiwall (MWNT) and single wall (SWNT) **carbon nanotubes** with alkali metals by electrochem. and vapor phase reactions. A LiC10 compound was produced by full electrochem. reduction of MWNT. KC8 and CsC8-MWNT 1st stage derivs. were synthesized in conditions of alkali vapor saturation Their identity periods and the 2 + 2 R 0° alkali superlattice are comparable to their parent graphite compds. The dysonian shape of KC8 EPR line and the temperature-independent Pauli susceptibility are both characteristic of a metallic behavior, which was confirmed by 13C NMR anisotropic shifts. Exposure of SWNT bundles to alkali vapor increased the pristine triangular lattice from 1.67 nm to 1.85 nm and 1.87 nm for potassium and rubidium, resp.
ST **carbon nanotube** alkali **metal intercalation** compd prepn; lithium **carbon nanotube** intercalation compd prepn; potassium **carbon nanotube** intercalation compd prepn; cesium **carbon nanotube** intercalation compd prepn
IT **Nanotubes**
RL: PRP (Properties); **SPN (Synthetic preparation); PREP (Preparation)**
(**carbon**, alkali metal compds.; preparation of alkali-**metal**

carbon nanotube intercalation compds.)

IT Alkali metal compounds
Intercalation compounds
RL: PRP (Properties); **SPN (Synthetic preparation); PREP (Preparation)**
(preparation of alkali-**metal carbon nanotube intercalation** compds.)

IT 7439-93-2DP, Lithium, **carbon nanotube** compound, preparation 7440-09-7DP, Potassium, **carbon nanotube** compound, preparation 7440-17-7DP, Rubidium, **carbon nanotube** compound, preparation 7440-46-2DP, Cesium, **carbon nanotube** compound, preparation
RL: PRP (Properties); **SPN (Synthetic preparation); PREP (Preparation)**
(preparation of alkali-**metal carbon nanotube intercalation** compds.)

RE.CNT 10 THERE ARE 10 CITED REFERENCES AVAILABLE FOR THIS RECORD

RE

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L39 ANSWER 42 OF 60 HCAPLUS COPYRIGHT 2004 ACS on STN
AN 1999:22123 HCAPLUS
DN 130:162353
ED Entered STN: 12 Jan 1999
TI Well-aligned **carbon** nitride **nanotubes** synthesized in anodic alumina by electron cyclotron resonance chemical vapor deposition
AU Sung, S. L.; Tsai, S. H.; Tseng, C. H.; Chiang, F. K.; Liu, X. W.; Shih, H. C.
CS Department of Materials Science and Engineering, National Tsing Hua University, Hsinchu, 300, Taiwan
SO Applied Physics Letters (1999), 74(2), 197-199
CODEN: APPLAB; ISSN: 0003-6951
PB American Institute of Physics
DT Journal
LA English
CC 78-8 (Inorganic Chemicals and Reactions)
AB Vertically aligned C nitride nanotubes with a uniform diameter of .apprx.250 nm were synthesized on a **porous** alumina **membrane** template (50-80 μm thick) in a microwave excited plasma of C2H2 and N2 using an electron cyclotron resonance CVD system. A neg. d.c. bias voltage was applied to the substrate holder of graphite to promote the flow of ionic fluxes through the nanochannels of the alumina template. This allowed the phys., and subsequent chemical, absorption of species on the walls of the nanochannels that gave the C nitride nanotubes. The hollow structure and vertically aligned properties of the nanotubes were clearly verified by field-emission scanning electron microscope images. The absorption band between 1250 and 1750 cm-1 in the FTIR spectroscopy spectrum proves that N atoms were incorporated into an amorphous network

of C.
ST **carbon** nitride **nanotube** prepn alumina substrate
IT Vapor deposition process
(chemical, infiltration; well-aligned **carbon** nitride **nanotubes** synthesized in anodic alumina by electron cyclotron resonance chemical vapor deposition)
IT Electron cyclotron resonance
Nanotubes
(well-aligned **carbon** nitride **nanotubes** synthesized in anodic alumina by electron cyclotron resonance chemical vapor deposition)
IT 74-86-2, Acetylene, reactions 7727-37-9, Nitrogen, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(reactant; well-aligned **carbon** nitride **nanotubes** synthesized in anodic alumina by electron cyclotron resonance chemical vapor deposition)
IT 1344-28-1, Alumina, uses
RL: NUU (Other use, unclassified); USES (Uses)
(well-aligned **carbon** nitride **nanotubes** synthesized in anodic alumina by electron cyclotron resonance chemical vapor deposition)
IT 154769-61-6P, Carbon nitride
RL: **SPN (Synthetic preparation); PREP (Preparation)**
(well-aligned **carbon** nitride **nanotubes** synthesized in anodic alumina by electron cyclotron resonance chemical vapor deposition)
RE.CNT 31 THERE ARE 31 CITED REFERENCES AVAILABLE FOR THIS RECORD
RE
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L39 ANSWER 43 OF 60 HCAPLUS COPYRIGHT 2004 ACS on STN
AN 1998:638805 HCAPLUS
DN 129:325181
ED Entered STN: 09 Oct 1998
TI **Carbon nanotubes**: synthesis, processing and intercalation
AU Zhou, O.; Bower, C.; Jin, L.; Suzuki, S.; Tanigaki, K.
CS Univ. of North Carolina Chapel Hill, Chapel Hill, NC, 27590-3255, USA
SO Proceedings - Electrochemical Society (1998), 98-8(Recent Advances in the Chemistry and Physics of Fullerenes and Related Materials), 885-896
CODEN: PESODO; ISSN: 0161-6374
PB Electrochemical Society
DT Journal
LA English
CC 78-1 (Inorganic Chemicals and Reactions)
Section cross-reference(s): 37
AB Single-walled **carbon nanotubes** (SWNTs) were synthesized by ablating a graphite target mixed with metal catalysts with a pulsed Nd:YAG laser. The quality and nature of the SWNTs produced depended sensitively on the ablation conditions. The average nanotube diameter was found to shift with the ablation laser frequency and the gas flow rate. **Carbon nanotube**/polymer composites were fabricated by solution casting. A method was developed to align the nanotubes inside the polymer matrix with controllable orientation and degree of alignment. SWNTs were **intercalated** with alkali **metals** and HNO3 mols. Intercalation and in-situ TEM/EELS measurements were also performed on individual nanotube bundles. Guest species can be reversibly intercalated to the interstitial sites between the nanotubes.
ST **carbon nanotube** prepn alignment intercalation; polymer matrix **carbon nanotube** alignment; cesium intercalation **carbon nanotube**; nitric acid intercalation **carbon nanotube**
IT **Nanotubes**
RL: PEP (Physical, engineering or chemical process); PRP (Properties); RCT (Reactant); **SPN (Synthetic preparation)**; **PREP (Preparation)**; PROC (Process); RACT (Reactant or reagent)
(**carbon**; preparation of **carbon nanotubes** by laser ablation of graphite mixed with Ni/Co catalyst, **nanotube** alignment in polymer matrix and **intercalation** with alkali **metals** or HNO3)
IT **Intercalation**
(of **carbon nanotubes** with alkali **metals** or nitric acid)
IT Polyethers, properties
Polyethers, properties
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process)
(polyamine-; alignment of **carbon nanotubes** in poly(hydroxyamino ether) matrix)
IT Polyamines
Polyamines
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process)

(polyether-; alignment of **carbon nanotubes** in poly(hydroxyamino ether) matrix)

IT 7440-46-2DP, Cesium, intercalation compound with **carbon nanotubes**, preparation 7697-37-2DP, Nitric acid, intercalation compound with **carbon nanotubes**, preparation
RL: PRP (Properties); **SPN (Synthetic preparation)**; **PREP (Preparation)**
(**intercalation** of **carbon nanotubes** with alkali **metals** or HNO3)

RE.CNT 19 THERE ARE 19 CITED REFERENCES AVAILABLE FOR THIS RECORD

RE

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(19) Zhou, O; Science 1994, V263, P1744 HCAPLUS

L39 ANSWER 44 OF 60 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 1998:199071 HCAPLUS
DN 128:316473
ED Entered STN: 08 Apr 1998

TI In-situ TEM and EELS studies of alkali-**metal intercalation** with single-walled **carbon nanotubes**

AU Suzuki, S.; Bower, C.; Zhou, O.
CS NTT Science and Core Technology Laboratory Group, Musashino, 180, Japan

SO Chemical Physics Letters (1998), 285(3,4), 230-234
CODEN: CHPLBC; ISSN: 0009-2614
PB Elsevier Science B.V.
DT Journal
LA English
CC 78-3 (Inorganic Chemicals and Reactions)

AB Cesium (Cs) or potassium (K) was deposited on single-walled **carbon nanotube** bundles in vacuum at room temperature The deposited bundles were analyzed in-situ by TEM and EELS techniques. Both Cs and K can be reversibly intercalated with the bundles. The intercalants reside in-between the individual nanotubes within the bundles. Intercalation caused structural disorder to the two-dimensional lattice of the pristine nanotube bundles. The chemical compns. of the nanotube bundles intercalated with K and Cs are about KC24 and CsC24 to CsC8.

ST alkali **metal intercalation carbon nanotube** EELS; potassium intercalation **carbon nanotube** TEM EELS; cesium intercalation **carbon nanotube** TEM EELS

IT Alkali metal compounds
RL: PRP (Properties); **SPN (Synthetic preparation); PREP (Preparation)**
(**carbon nanotubes**; In-situ TEM and EELS studies of alkali-**metal intercalation** with single-walled **carbon nanotubes**)
IT **Nanotubes**
RL: PRP (Properties); **SPN (Synthetic preparation); PREP (Preparation)**
(**carbon**, compds. with alkali metals; In-situ TEM and EELS studies of alkali-**metal intercalation** with single-walled **carbon nanotubes**)
IT 7440-09-7DP, Potassium, intercalation compds. with **carbon nanotubes**, preparation 7440-46-2DP, Cesium, intercalation compds. with **carbon nanotubes**, preparation
RL: PRP (Properties); **SPN (Synthetic preparation); PREP (Preparation)**
(In-situ TEM and EELS studies of alkali-**metal intercalation** with single-walled **carbon nanotubes**)
RE.CNT 9 THERE ARE 9 CITED REFERENCES AVAILABLE FOR THIS RECORD
RE
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(8) Thess, A; Nature 1996, V273, P483 HCAPLUS
(9) Zhou, O; Science 1994, V263, P1744 HCAPLUS

L39 ANSWER 45 OF 60 HCAPLUS COPYRIGHT 2004 ACS on STN
AN 1998:720547 HCAPLUS
DN 130:60121
ED Entered STN: 13 Nov 1998
TI Intercalation reactions in catalytic multiwall **carbon nanotubes**
AU Metenier, K.; Duclaux, L.; Gaucher, H.; Salvetat, J. P.; Lauginie, P.; Bonnamy, S.; Beguin, F.
CS CRMD, CNRS - Universite, 1b rue de la Ferollerie, Orleans, 45071, Fr.
SO AIP Conference Proceedings (1998), 442(Electronic Properties of Novel Materials--Progress in Molecular Nanostructures), 51-54
CODEN: APCPCS; ISSN: 0094-243X
PB American Institute of Physics
DT Journal
LA English
CC 78-3 (Inorganic Chemicals and Reactions)
AB Heat-treated catalytic multiwall **carbon nanotubes** (MWNTs) were **intercalated** by K and **FeCl3** in vapor phase, using the two-bulb technique. A 1st stage KC9 intercalation compound was formed with potassium. After elimination of potassium, the tubular morphol. is still preserved showing that intercalation is a reversible phenomenon. In the case of FeCl3, the saturated compound is less rich than with graphite. However, well defined in plane hk bands prove the intercalation. Due to the position of the 002 line at 0.345 nm, it is likely that intercalation is incomplete and that the material is a mixture

of intercalated and non intercalated zones. A model of catalytic nanotubes is presented which accounts for the reversibility of the intercalation reactions.

ST **carbon nanotube intercalation** potassium **ferric chloride; iron chloride intercalation carbon nanotube**

IT **Nanotubes**
RL: **SPN (Synthetic preparation); PREP (Preparation)**
(**carbon, intercalation** compds. with potassium and **ferric chloride; intercalation** of multiwall **carbon nanotubes** with potassium and ferric chloride)

IT Intercalation
(intercalation of multiwall **carbon nanotubes** with potassium and ferric chloride)

IT 7440-09-7DP, Potassium, intercalation compds. with **carbon nanotubes**, preparation 7705-08-0DP, **Ferric chloride, intercalation** compds. with **carbon nanotubes**
RL: PRP (Properties); **SPN (Synthetic preparation); PREP (Preparation)**
(**intercalation** of multiwall **carbon nanotubes** with potassium and ferric chloride)

RE.CNT 8 THERE ARE 8 CITED REFERENCES AVAILABLE FOR THIS RECORD

RE

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L39 ANSWER 46 OF 60 HCAPLUS COPYRIGHT 2004 ACS on STN
AN 1998:416818 HCAPLUS
DN 129:130357
ED Entered STN: 08 Jul 1998
TI Synthesis and structure of pristine and alkali-**metal-intercalated** single-walled **carbon nanotubes**
AU Bower, C.; Suzuki, S.; Tanigaki, K.; Zhou, O.
CS Department Physics Astronomy, University North Carolina, Chapel Hill, NC, 27599, USA
SO Applied Physics A: Materials Science & Processing (1998), A67(1), 47-52
CODEN: APAMFC; ISSN: 0947-8396
PB Springer-Verlag
DT Journal
LA English
CC 78-1 (Inorganic Chemicals and Reactions)
Section cross-reference(s): 75
AB Single-walled C nanotubes (SWNTs) were synthesized by ablating graphite targets with either the primary (1064 nm) or the 2nd-harmonic (532 nm) beam of a pulsed Nd:YAG laser at high temperature The structure and the morphol. of the raw materials were studied by high-resolution TEM (HRTEM), x-ray diffraction, and micro-Raman techniques. The diameter distribution of the SWNTs was found to vary with the laser frequency used for ablation. The raw materials were reacted with alkali metal (K, Cs) by vapor transport method. The saturation composition was found to be MC8 (M = K or Cs). No

crystalline structure was observed in the reacted materials by x-ray diffraction.
In situ metal deposition, TEM, and EELS measurements were performed on individual SWNT bundles at 300 K. The results showed that alkali **metals** can be reversibly **intercalated** into the SWNT bundles. Although intercalation-induced structural disorder, individual nanotubes and to a large extent the bundles maintained their structural integrity after intercalation and de-intercalation.

ST **carbon nanotube** prepn laser ablation crystallinity; alkali **metal intercalation carbon nanotube** disorder

IT **Nanotubes**
RL: PRP (Properties); RCT (Reactant); **SPN (Synthetic preparation)**; **PREP (Preparation)**; RACT (Reactant or reagent)
(**carbon**; preparation and structure of pristine and alkali-**metal-intercalated** single-walled **carbon nanotubes**)

IT Disorder
(**intercalation** of alkali **metals** into single-walled **carbon nanotubes** and their structural disorder)

IT Vapor deposition process
(laser ablation; preparation of single-walled **carbon nanotubes** by)

IT **Intercalation**
(of alkali **metals** into single-walled **carbon nanotubes** and their structural disorder)

IT Crystallinity
(of single-walled **carbon nanotubes** prepared by laser ablation)

IT 7440-09-7DP, Potassium, intercalation compound with **carbon nanotubes**, preparation 7440-46-2DP, Cesium, intercalation compound with **carbon nanotubes**, preparation
RL: PRP (Properties); **SPN (Synthetic preparation)**; **PREP (Preparation)**
(preparation and structure of pristine and alkali-**metal-intercalated** single-walled **carbon nanotubes**)

IT 7440-09-7, Potassium, reactions 7440-46-2, Cesium, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(preparation and structure of pristine and alkali-**metal-intercalated** single-walled **carbon nanotubes**)

L39 ANSWER 47 OF 60 HCAPLUS COPYRIGHT 2004 ACS on STN
AN 1998:810973 HCAPLUS
DN 130:176592
ED Entered STN: 30 Dec 1998
TI Crystalline ropes of metallic **carbon nanotubes**
AU Smalley, R. E.
CS Center of Nanoscale Science and Technology Rice University, Houston, TX, USA
SO Springer Series in Materials Science (1998), 33(Supercarbon), 31-40
CODEN: SSMSE2; ISSN: 0933-033X
PB Springer-Verlag
DT Journal; General Review
LA English
CC 78-0 (Inorganic Chemicals and Reactions)
AB A review with 11 refs. on the preparation, growth mechanism, and mech. and

electronic properties of metallic C nanotubes. A modification of the fullerene synthesis by adding 1% of Ni or Co to the vapor led to the formation of the single-walled nanotubes the growth behavior, microstructure, and properties of which are described.

ST review **carbon nanotube** prepn **metal dopant**; phys property **carbon nanotube** review

IT **Nanotubes**
RL: PRP (Properties); **SPN (Synthetic preparation)**; **PREP (Preparation)**
(**carbon**; preparation of crystalline ropes of **metallic** C **nanotubes** using **metal dopants** and **nanotube** properties)

IT Physical properties
(preparation of crystalline ropes of **metallic** C nanotubes using **metal dopants** and nanotube properties)

IT Metals, uses
RL: MOA (Modifier or additive use); USES (Uses)
(preparation of crystalline ropes of **metallic** C nanotubes using **metal dopants** and nanotube properties)

IT 7440-44-0P, Carbon, preparation
RL: PRP (Properties); **SPN (Synthetic preparation)**; **PREP (Preparation)**
(preparation of crystalline ropes of **metallic** C **nanotubes** using **metal dopants** and **nanotube** properties)

RE.CNT 11 THERE ARE 11 CITED REFERENCES AVAILABLE FOR THIS RECORD

RE

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L39 ANSWER 48 OF 60 HCAPLUS COPYRIGHT 2004 ACS on STN
AN 1998:336603 HCAPLUS
DN 129:75421
ED Entered STN: 05 Jun 1998
TI High pressure for synthesis and study of superdense alkali metal-carbon compounds
AU Nalimova, Vera A.
CS Department of Chemistry and Physics of High Pressures, Moscow State University, Moscow, 119899, Russia
SO Molecular Crystals and Liquid Crystals Science and Technology, Section A: Molecular Crystals and Liquid Crystals (1998), 310, 5-17
CODEN: MCLCE9; ISSN: 1058-725X
PB Gordon & Breach Science Publishers
DT Journal; General Review
LA English
CC 78-0 (Inorganic Chemicals and Reactions)
AB A review, with 38 refs., is given on the preparation of superdense alkali **metal**-carbon compds. by high pressure **intercalation** methods. **Intercalation** of alkali **metals** into graphite

and other carbon matrixes with large volume decrement is favored by high pressures: the temperature of the reaction decreases and the amount of **intercalated metal** increases 2 to 3 times in comparison with the compds. obtained under traditional conditions. Superdense alkali metal in carbon matrixes exposes unusual valence state with high degree of p- and d-states in chemical bonding.

ST review alkali **metal intercalation** graphite fullerene; fulleride alkali **metal intercalation** review; **carbon nanotube** alkali **metal intercalation** review

IT Fullerides
RL: PRP (Properties); **SPN (Synthetic preparation)**; **PREP (Preparation)**
(alkali **metal**; high pressure **intercalation** of alkali **metals** in graphite, fullerenes and **carbon nanotubes** to give superdense alkali metal-carbon compds.)

IT **Nanotubes**
RL: PRP (Properties); **SPN (Synthetic preparation)**; **PREP (Preparation)**
(**carbon**, alkali **metal intercalated**; high pressure **intercalation** of alkali **metals** in graphite, fullerenes and **carbon nanotubes** to give superdense alkali metal-carbon compds.)

IT **Intercalation**
(high pressure **intercalation** of alkali **metals** in graphite, fullerenes and **carbon nanotubes** to give superdense alkali metal-carbon compds.)

IT Intercalation compounds
RL: PRP (Properties); **SPN (Synthetic preparation)**; **PREP (Preparation)**
(high pressure **intercalation** of alkali **metals** in graphite, fullerenes and **carbon nanotubes** to give superdense alkali metal-carbon compds.)

IT Alkali **metals**, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(high pressure **intercalation** of alkali **metals** in graphite, fullerenes and **carbon nanotubes** to give superdense alkali metal-carbon compds.)

IT 7782-42-5DP, Graphite, alkali **metal intercalated**, preparation
RL: PRP (Properties); **SPN (Synthetic preparation)**; **PREP (Preparation)**
(high pressure **intercalation** of alkali **metals** in graphite, fullerenes and **carbon nanotubes** to give superdense alkali metal-carbon compds.)

RE.CNT 56 THERE ARE 56 CITED REFERENCES AVAILABLE FOR THIS RECORD

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L39 ANSWER 49 OF 60 HCAPLUS COPYRIGHT 2004 ACS on STN
AN 1997:370142 HCAPLUS
DN 127:12458
ED Entered STN: 13 Jun 1997
TI Intercalation into **carbon nanotubes** without breaking the tubular structure
AU Mordkovich, V. Z.; Baxendale, M.; Chang, R. P. H.; Yoshimura, S.
CS Yoshimura π-Electron Materials Project, ERATO, JRDC, c/o Matsushita R.I.T., Inc., Kawasaki, 214, Japan
SO Synthetic Metals (1997), 86(1-3), 2049-2050
CODEN: SYMEDZ; ISSN: 0379-6779
PB Elsevier

DT Journal
LA English
CC 78-1 (Inorganic Chemicals and Reactions)
AB The authors report the first observation of intercalation into **carbon nanotubes** without breaking the tubular structure. Both K-**intercalated** and **FeCl3-intercalated** tubes were produced by a gas-phase reaction of oriented multiwall buckybundle material with potassium metal and iron(III) chloride, resp. The resulting material preserves its oriented structure. It was studied by x-ray diffraction, SEM, weight uptake and magnetoresistance measurement techniques. Interlayer spacing in the intercalated tubes is very close to that in corresponding graphite intercalation compds. Intercalated buckybundles exhibit some noteworthy galvanomagnetic properties including random conductance fluctuations. The intercalation process is accompanied by swelling of the tubes. The swollen sections alternate nonintercalated necks forming an impressive bead-line pattern.
ST **carbon nanotube intercalation** potassium **iron chloride**
IT **Nanotubes**
RL: PRP (Properties); **SPN (Synthetic preparation); PREP (Preparation)**
(**carbon, intercalation** product with potassium or **ferric chloride**; preparation, x-ray diffraction and galvanomagnetic properties of **carbon nanotubes intercalated** with potassium or **ferric chloride**)
IT Galvanomagnetic properties
Intercalation
(preparation, x-ray diffraction and galvanomagnetic properties of **carbon nanotubes intercalated** with potassium or **ferric chloride**)
IT 7440-09-7DP, Potassium, intercalation product with **carbon nanotubes**, preparation 7705-08-0DP, **Ferric chloride, intercalation** product with **carbon nanotubes**
RL: PRP (Properties); **SPN (Synthetic preparation); PREP (Preparation)**
(preparation, x-ray diffraction and galvanomagnetic properties of **carbon nanotubes intercalated** with potassium or **ferric chloride**)

L39 ANSWER 50 OF 60 JICST-EPlus COPYRIGHT 2004 JST on STN
AN 970898085 JICST-EPlus
TI Molecular Dynamics Study of Gas Permeation in **Porous** Inorganic **Membranes.**
AU TAKABA HIROMITSU; MIZUKAMI KOICHI; OUMI YASUNORI; CHATTERJEE A; KUBO MOMOJI; MIYAMOTO AKIRA
CS Tohoku Univ., Grad. Sch.
SO Shokubai (Catalysts & Catalysis), (1997) vol. 39, no. 6, pp. 436-439.
Journal Code: F0319A (Fig. 9, Tbl. 1, Ref. 11)
CODEN: SHKUAJ; ISSN: 0559-8958
CY Japan
DT Journal; Short Communication
LA Japanese
STA New
AB The permeation of gas molecules through the inorganic **membranes** was investigated. Knudsen flow is reproduced well using our model. This model was used for simulating the system which includes amorphous silica

and zeolite **membranes**. The permeation of CO2 through the silica **membrane** was higher than that of N2. This is because the difference of the molecular orientation along the flow direction. The permeation of butane isomers thorough ZSM-5 type silicalite **membrane** was investigated. Calculated permeability of n-butane showed good agreement with available experiment. Moreover, the applicability of carbon **nanotube** for the separation of organic molecules such as 2,6-dimethyl naphthalene and 2,7-dimethyl naphthalene was also demonstrated. (author abst.)

CC XD02120Z (66.081.6)

CT **membrane** separation; diffusion; molecular dynamics; selectivity; **membrane** permeability; gas flow; thin film; silica; synthetic zeolite; molecular sieve; carbon dioxide; nitrogen; steric effect; porous medium; chemical reactor; separation; carbon; molecular cluster; nanostructure; **membrane** reactor; gas separation; **nanotube**; alkane; polynuclear aromatic compound

BT transport phenomenon; phenomenon; dynamics; property; osmosis; transmission(propagation); fluid flow; **membrane** and film; silicon dioxide; silicon oxide; silicon compound; carbon group element compound; oxide; chalcogenide; oxygen group element compound; oxygen compound; adsorbent; carbon oxide; carbon compound; second row element; element; nitrogen group element; effect; porous object; chemical equipment; equipment; carbon group element; molecule; structure; aliphatic hydrocarbon; hydrocarbon; aromatic compound

L39 ANSWER 51 OF 60 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN DUPLICATE 1

AN 1996-461144 [46] WPIX

CR 1994-300284 [37]

DNC C1996-144409

TI Purifying carbon **nano-tubes** - comprises dispersing crude prods. containing carbon **nano-tubes** in solvent, passing dispersion through chromatograph column, separating **nano-tubes**, etc..

DC E36 F01 J04 L02

PA (NIDE) NEC CORP

CYC 1

PI JP 08231210 A 19960910 (199646)* 7p C01B031-02 <--
JP 2735055 B2 19980402 (199818) 7p C01B031-02 <--

ADT JP 08231210 A Div ex JP 1993-14387 19930201, JP 1995-311821 19930201; JP 2735055 B2 Div ex JP 1993-14387 19930201, JP 1995-311821 19930201

FDT JP 2735055 B2 Previous Publ. JP 08231210

PRAI JP 1993-14387 19930201; JP 1995-311821 19930201

IC ICM **C01B031-02**
ICS B01D061-14; C30B029-02; C30B033-00

ICA B01J021-18; D01F009-127

AB JP 08231210 A UPAB: 19961115
Purifying carbon **nano-tubes** comprises: (1) dispersing crude prods. containing carbon **nano-tubes** in a solvent by ultra-sonification; (2) passing the dispersion through a chromatograph column to separate the carbon **nano-tubes** from the other carbon contents; (3) separating the **nano-tubes** in accordance with mol. weight and shapes by column chromatography; (4) scattering the separated carbon **nano-tubes** in a rotating drum and irradiating electron beams or corona discharge shower on them, so that they are charged; and (5) rotating the drum so as to separate carbon **nano-tubes** which are metallic and are not charged from charged insulating carbon **nano-tubes**.

Also claimed is a further process in which carbon **nano-**

tubes are separated with a filter **membrane** which has micropores micrometer or nanometer in size after (1) above, then they are separated as (4) and (5) above.

Further claimed is a process in which carbon **nano-tubes** are ultra-centrifugally separated after (1) above, then they are separated by (4) and (5) above..

USE - Used for separating carbon **nano-tubes** from the other carbon contents by-produced.

ADVANTAGE - Carbon **nano-tubes** which are uniform w.r.t. electrical conductivity are obtd..

Dwg.0/0

FS CPI
FA AB; GI; DCN
MC CPI: E11-Q01; E31-N04; F01-D09A; F01-E03; F01-H; J04-X; L02-A02; L02-H04

L39 ANSWER 52 OF 60 HCAPLUS COPYRIGHT 2004 ACS on STN
AN 1996:679882 HCAPLUS
DN 126:25865
ED Entered STN: 18 Nov 1996
TI Intercalation into **carbon nanotubes**
AU Mordkovich, V. Z.; Baxendale, M.; Yoshimura, S.; Chang, R. P. H.
CS Yoshimura π-Electron Materials Project, Matsushita Res. Inst. Tokyo, Inc., Kawasaki, 214, Japan
SO Carbon (1996), 34(10), 1301-1303
CODEN: CRBNAH; ISSN: 0008-6223
PB Elsevier
DT Journal
LA English
CC 78-3 (Inorganic Chemicals and Reactions)
Section cross-reference(s): 77
AB Bundles of **carbon nanotubes**, "buckybundles", were **intercalated** with potassium **metal** or iron(III) chloride. The microscopic fibrous structure was maintained, although the fibers were damaged and misoriented. Substantial weight uptake and swelling was observed Magnetoresistance measurements were made for pristine and intercalated buckybundles.
ST **carbon nanotube** potassium **iron chloride intercalation**
IT **Nanotubes**
RL: PRP (Properties); **SPN (Synthetic preparation)**; **PREP (Preparation)**
(**carbon, intercalation** compds. with potassium or **ferric chloride**; preparation and magnetoresistance of)
IT Magnetoresistance
(of **carbon nanotubes intercalated** with potassium or **ferric chloride**)
IT 7440-09-7DP, Potassium, intercalation compds. with **carbon nanotubes**, preparation 7705-08-0DP, **Ferric chloride, intercalation** compds. with **carbon nanotubes**
RL: PRP (Properties); **SPN (Synthetic preparation)**; **PREP (Preparation)**
(preparation and magnetoresistance of)

L39 ANSWER 53 OF 60 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 1994-300284 [37] WPIX
CR 1996-461144 [46]
DNC C1994-137175

TI Purificn. of carbon.**nano-tube** - by dispersing crude prod. in solvent with ultrasonic energy, and passing through chromatography columns..
DC E36 F01 J04 L02
PA (NIDE) NEC CORP
CYC 1
PI JP 06228824 A 19940816 (199437)* 7p D01F009-12
JP 2522469 B2 19960807 (199636) 5p D01F009-12
ADT JP 06228824 A JP 1993-14387 19930201; JP 2522469 B2 JP 1993-14387 19930201
FDT JP 2522469 B2 Previous Publ. JP 06228824
PRAI JP 1993-14387 19930201
IC ICM D01F009-12
ICS B01D061-14; **C01B031-02**; C30B033-00
AB JP 06228824 A UPAB: 19961124
Purification of a carbon.**nanotube** comprises dispersing a crude prod. containing carbon.**nanotube** into a solvent with ultrasonic vibration, separating carbon substance other than **nanotube** and nano particle by passing the solution into column for chromatography, further using column chromatography separating the carbon.**nanotube** by difference of flow rate in the column by difference of molecular weight, shape between the **nanotube** and the nano particle.

Alternatively purification of the carbon.**nanotube** comprises dispersing as above, filtering the solution with a **membrane** having a desired pore size from micron to nanometer order. Another purificn. comprises dispersing as above, and separating the carbon.**nanotube** from the solution with a centrifugal separator.

USE/ADVANTAGE - The carbon.**nanotube** is especially useful for the electric industry field such as first order fine line, catalyst. Good quality carbon.**nanotube** which is uniform with regard to molecular weight, size and electric conductivity is obtd.
Dwg.1/1
FS CPI
FA AB; GI; DCN
MC CPI: E11-Q01; E31-N03; F01-D09A; J01-D01A; J04-E04; L02-H04; N04-A; N06-E

L39 ANSWER 54 OF 60 HCAPLUS COPYRIGHT 2004 ACS on STN
AN 1995:326429 HCAPLUS
DN 122:149950
ED Entered STN: 01 Feb 1995
TI Chemical purification of **carbon nanotubes** by use of graphite intercalation compounds
AU Ikazaki, F.; Ohshima, S.; Uchida, K.; Kuriki, Y.; Hayakawa, H.; Yumura, M.; Takahashi, K.; Tojima, K.
CS National Institute Materials Chemical Research, Ibaraki, 305, Japan
SO Carbon (1994), 32(8), 1539-42
CODEN: CRBNAH; ISSN: 0008-6223
PB Elsevier
DT Journal
LA English
CC 78-1 (Inorganic Chemicals and Reactions)
AB A method is described for separation and purification of **carbon nanotubes** from a cathodic deposit (soot) containing graphite. The nanotubes are obtained by intercalation of CuCl2 followed by reduction of the Cu2+ and thermal oxidation to give copper oxides and nanotubes. The oxide is removed by acid cleaning. The extent of purification and size of resulting nanotubes is discussed.
ST **carbon nanotube** graphite sepn purifn intercalation; copper intercalation **carbon nanotube** graphite sepn

IT Soot
RL: PUR (Purification or recovery); **PREP (Preparation)**
(chemical purification of **carbon nanotubes** from graphite in soot with copper intercalation)
IT Inclusion reaction
(intercalation, chemical purification of **carbon nanotubes** from graphite in soot with copper intercalation)
IT Fullerenes
RL: PUR (Purification or recovery); **PREP (Preparation)**
(tubular, chemical purification of **carbon nanotubes** from graphite in soot with copper intercalation)
IT 7782-42-5P, Graphite, preparation
RL: BYP (Byproduct); **PREP (Preparation)**
(chemical purification of **carbon nanotubes** from graphite in soot with copper intercalation)
IT 7440-44-0P, Carbon, preparation
RL: PUR (Purification or recovery); **SPN (Synthetic preparation)**; **PREP (Preparation)**
(chemical purification of **carbon nanotubes** from graphite in soot with copper intercalation)
IT 7440-50-8DP, Copper, graphite intercalation compound 7447-39-4DP, Copper **chloride** (CuCl2), graphite **intercalation** compound 7782-42-5DP, Graphite, copper **chloride** and **metallic** copper **intercalation** compds.
RL: RCT (Reactant); **SPN (Synthetic preparation)**; **PREP (Preparation)**; RACT (Reactant or reagent)
(chemical purification of **carbon nanotubes** from graphite in soot with copper intercalation)

L39 ANSWER 55 OF 60 JAPIO (C) 2004 JPO on STN
AN 2002-338221 JAPIO
TI METHOD FOR PRODUCING ORIENTING CARBON **NANOTUBE MEMBRANE**
IN SOMEYA MASAO; FUJII TAKASHI; HIRATA MASUKAZU; HORIUCHI SHIGEO
PA MITSUBISHI GAS CHEM CO INC
PI JP 2002338221 A 20021127 Heisei
AI JP 2001-372026 (JP2001372026 Heisei) 20011031
PRAI JP 2001-120357 20010314
SO PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 2002
IC ICM **C01B031-02**
ICS B01J023-75; B01J023-755; B01J035-02; B01J037-02; B01J037-03; C30B029-66
AB PROBLEM TO BE SOLVED: To provide a method for producing an orienting carbon **nanotube membrane** consisting of oriented numerous carbon **nanotubes**.
SOLUTION: In the method for producing an orienting carbon **nanotube membrane**, a carbon compound is decomposed using a substrate which is coated with an element having no catalytic activity by itself and on which a metal element having catalytic activity or its compound has been carried to form a carbon **nanotube membrane** oriented in a direction perpendicular to the substrate on the surface of the substrate. The objective **membrane** of orienting carbon **nanotubes** of a small outside diameter is obtained.
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L39 ANSWER 56 OF 60 JAPIO (C) 2004 JPO on STN
AN 2002-293523 JAPIO
TI CARBON **NANOTUBE MEMBRANE**, SIC SUBSTRATE CONTAINING THE SAME, PRODUCT MADE OF THE SAME AND THEIR PRODUCTION METHOD

IN NAGANO TAKAYUKI; SHIBATA NORIYOSHI
PA JAPAN FINE CERAMICS CENTER
PI JP 2002293523 A 20021009 Heisei
AI JP 2001-102357 (JP2001102357 Heisei) 20010330
PRAI JP 2001-102357 20010330
SO PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 2002
IC ICM **C01B031-02**
ICS B82B001-00; B82B003-00; C23C016-01; C23C016-42
AB PROBLEM TO BE SOLVED: To provide a production method of a carbon **nanotube membrane** which orients in the predetermined direction, a SiC substrate containing the same and a product made of the same, at a large area and a low cost.
SOLUTION: A polycrystalline silicon carbide film 2 is formed on the substrate 1, and then the substrate 1 is dipped in a process liquid and the polycrystalline film of silicon carbide is removed from the substrate. The silicon carbide polycrystalline film 2a separated in the vacuum is heated at the temperature at which a silicon atom is lost from the surface of the silicon carbide polycrystalline film by decomposing the silicon carbide, and the silicon atom is removed from the silicon carbide. This carbon **nanotube membrane** 3 consists of a lot of carbon **nanotube** which is formed and grown toward an inner part from the surface of the silicon carbide polycrystalline base 2b.
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L39 ANSWER 57 OF 60 JAPIO (C) 2004 JPO on STN
AN 2002-293522 JAPIO
TI **NANOTUBE MEMBRANE** AND ITS PRODUCTION METHOD
IN ITO MASAAKI; SAGO SUMUTO; KUSUNOKI MICHIKO
PA NORITAKE CO LTD
JAPAN FINE CERAMICS CENTER
PI JP 2002293522 A 20021009 Heisei
AI JP 2001-100019 (JP2001100019 Heisei) 20010330
PRAI JP 2001-100019 20010330
SO PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 2002
IC ICM **C01B031-02**
ICS B82B001-00; B82B003-00
AB PROBLEM TO BE SOLVED: To provide a production method of a carbon **nanotube membrane** with high characteristics and produced in a simple process at a low cost.
SOLUTION: In a vacuum heat treatment process, the substrate 24, for instance, is heated at the temperature of about 1700°C under the pressure of 10<SP>-2</SP> Pa for about 10 hours and the silicon removal layer 28 of the surface becomes thick gradually. This thickened silicon removal layer 28 comprises the disorganized carbon layer 34 in a lower layer and the upper layer supported by the **nanotube** layer 38. Therefore, since the bonding strength of carbon which comprises the carbon layer 34 is far smaller than the bonding strength of six membered ring which comprises the **nanotube** 12, if this substrate 24 is heated in the atmosphere in the following oxidation heat treatment process, the **nanotube membrane** 10 is also obtained by preferentially decomposing the carbon layer 34 among the silicon removal layers 28. Accordingly the **nanotube membrane** 10 can easily be produced and a low cost.
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L39 ANSWER 58 OF 60 JAPIO (C) 2004 JPO on STN
AN 2002-190247 JAPIO
TI CNT **MEMBRANE** AND METHOD FOR MAKING THE SAME AND FIELD EMISSION

TYPE COLD CATHODE AND IMAGE DISPLAY DEVICE USING THE CNT **MEMBRANE**
IN KONUMA KAZUO; ITO FUMINORI; OKAMOTO AKIHIKO; TOMIHARI YOSHINORI; OKADA HIROKO
PA NEC CORP
PI JP 2002190247 A 20020705 Heisei
AI JP 2000-386669 (JP2000386669 Heisei) 20001220
PRAI JP 2000-386669 20001220
SO PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 2002
IC ICM H01J001-304
ICS **C01B031-02**; H01J009-02; H01J029-04; H01J031-12
AB PROBLEM TO BE SOLVED: To provide a CNT **membrane** that can secure mechanical **membrane** strength without depending only on an organic binder, can easily obtain a flat shape without bubbles in the **membrane**, and can eliminate a complicated CNT refining step such as removing impurities other than **nano-tubes** more than necessary, and can reduce degradation in electron emission characteristic due to increase in the diameter of a bundle.
SOLUTION: In this carbon **nano-tube**(CNT) and CNT **membrane** 12 containing particulate impurities, the area ratio of CNT 12a to particulate impurities in a cross section and surface structure is set in the range of 0.5:99.5 to 40:60. In such a CNT **membrane** 12, the particulate impurities may be made to be composed of the impurities that are obtained along with the CNT 12a during manufacture of the CNT 12a.
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L39 ANSWER 59 OF 60 JAPIO (C) 2004 JPO on STN
AN 2001-048507 JAPIO
TI PRODUCTION OF CARBON **NANOTUBE** AND PRODUCTION OF CARBON **NANOTUBE MEMBRANE**
IN INAGAKI HIROTAKA; TATEISHI HIROSHI
PA TOSHIBA CORP
PI JP 2001048507 A 20010220 Heisei
AI JP 1999-225487 (JP11225487 Heisei) 19990809
PRAI JP 1999-225487 19990809
SO PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 2001
IC ICM **C01B031-02**
AB PROBLEM TO BE SOLVED: To obtain a highly oriented carbon **nanotube** by a heat treatment at a low temperature by bringing a carbide of a specific element into contact with a reactional gas containing a halogen at a specific temperature and removing elements except carbon from the carbide.
SOLUTION: A carbide substrate 9 is brought into contact with a gas 10 containing a halogen at a temperature within the range of 200-1,500°C, preferably <=1,200°C and elements except carbon are converted into halides 11 and removed from the carbide substrate 9 to produce a carbon **nanotube** 13 by the reaction represented by the formula: MC (s)+Hal (g) → MHal (g)+C (s) for the carbide MC of the element M. The element M is preferably at least one kind selected from the group of Ti, Zr, Hf, V, Nb, Ta, Cr, Mo, W, Mn, Co, Fe, Ni, Zn, Al and Si and the halogen used as a reactional gas is preferably at least one kind of chlorine or fluorine. The thick and long **nanotube** 13 is obtained when a partial pressure of the reactional gas is increased.
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L39 ANSWER 60 OF 60 JAPIO (C) 2004 JPO on STN
AN 2000-109308 JAPIO
TI PRODUCTION OF CARBON **NANOTUBE MEMBRANE**

IN TANI YUKARI; SHIBATA NORIYOSHI; KUSUNOKI MICHIKO
PA JAPAN FINE CERAMICS CENTER
PI JP 2000109308 A 20000418 Heisei
AI JP 1998-282214 (JP10282214 Heisei) 19981005
PRAI JP 1998-282214 19981005
SO PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 2000
IC ICM **C01B031-02**
ICS B01D071-02; C30B025-18; C30B029-36; C30B029-66; C30B033-02
AB PROBLEM TO BE SOLVED: To inexpensively produce a self-sustained carbon **nanotube membrane** having a large are and a carbon **nanotube membrane** having various surface shapes.
SOLUTION: A thin silicon carbide single crystal film 4 is formed on a silicon wafer 3 by the epitaxial growth of a silicon carbide crystal. The silicon wafer 3 is then etched by immersion in an etching solution to separate the thin silicon carbide single crystal film 4 from the wafer 3 and the thin silicon carbide single crystal film 4 is converted into the objective carbon **nanotube membrane** 2 by heating to a high temperature in vacuum containing a trace amount of oxygen or in an oxygen-containing inert gas.

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